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EDITORIAL.

IN A RECENT issue we referred to the visit of the Iron and Steel Institute of Great Britain as occurring in August. It should have been October; the members of the Institute will arrive here late in October, and their visit will extend well into November.

THE ARTICLE, appearing in this issue, by Mr. Henry S. Munroe, Professor of Mining at the Columbia School of Mines, is a most timely contribution on an important subject. In his discussion of the equipment of laboratories, Profesor Munroe has dealt mainly with mining instruction, for it will be remembered that Mr. Henry M. Howe has already covered the metallurgical aspect of the enquiry in his published writings. We are glad to say that in response to our suggestion regarding the importance of laboratory equipment in connection with technical education, several contributions have been forwarded, and they will be published in forthcoming issues of this JOURNAL.

THE OLD PROVERB that when the members of a certain class of the community—which shall be nameless here—fall out, those of another class get their dues, seems to be exemplified in the very interesting incidental information brought out by the gas suits now in progress at Boston. This information relates to copper stocks, rather than to gas, and must be very interesting reading to holders, and to former holders and speculators in those stocks. It is true that some of this information is not new in a way, but the testimony confirms and makes definite many things that have been only suspected. How long these revelations are to continue we do not know, but the report of them is certainly worth reading by stockholders.

CABLE DESPATCHES announce an important decision in London in connection with the cleaning up of the wreck of the Standard Exploration Company, one of the late Whitaker Wright's financial derelicts. The English courts have decided that the directors are responsible to the shareholders who were deceived by a fraudulent prospectus. In this case, as in many others, a reckless adventurer

was enabled to allure the innocent public by reason of the support of reputable men who lent impressive names to a shallow fraud. The decision will do much to relegate the titled incompetent back to those duties for which his training befits him, and will, it is hoped, render it more difficult for unscrupulous promoters to use a great pro-consul, or a distinguished general, or an admiral of renown, as so many lures to bait the financial hook or to attract the unwary after the fashion of the wooden Indian whose impassive front marks the entrance to a cigar store.

We have heretofore referred to the decision of the California Supreme Court in the Kate Hayes case, which placed ground-sluice mining practically in the same class as hydraulic mining, and which enjoined a ground-sluice operation as a public nuisance on account of the debris resulting from it. This decision has caused a great deal of discussion in California, and the general opinion of mine operators there confirms that expressed in the Journal, which was that the decision could easily be extended to include quartz mining and other operations in which tailings were discharged into any stream. In other words, the Anti-Debris Association could proceed to tie up almost nine-tenths of the mines in the State, should the decision be carried to its full conclusions. The matter is being very actively discussed, and steps are being taken by the California Miners' Association to counteract the effects of the decision, if possible; while the Anti-Debris Association is equally active in its endeavors to enforce its view of the case. The question is certainly one of great importance to the miners of California. It is referred to at length in our San Francisco correspondent's letter, on another page.

It appears strange that it should be left to the twentieth century to see the development of the region to which many ethnologists refer the origin of the human race. The high plateau of central Asia has been the home of many tribes and races; but nothing was known of its mineral deposits through all the centuries, with the exception of the winning of a little gold from some of the riverbeds. Since the occupation of Turkestan by the Russians, however, the geology of the country and its economic possibilities have been studied, and some results have been attained. We have heretofore referred to the gold deposits of Turkestan, and the article by M. E. D. Levat, given on another page, contains some interesting facts on the known and probable resources of the region in coal and petroleum. The Russian railroads and settlements are opening up the country; and it is quite possible that it may become a mining region of considerable importance.

BLAST FURNACES AS A NUISANCE.

The decision of the Pennsylvania Supreme Court in the Jones & Laughlin case, referred to in our columns last week, reaches further than was indicated by the first despatches. The action of the lower court is revised, and the company is perpetually enjoined from such operation of its blast furnaces as will cause dust to be distributed upon adjoining property. This leaves three courses open to the company; the closing down of its furnaces, which would embarrass its other operations too seriously to permit its adoption; the use of other ores, instead of the Mesabi ores, which now form most of the furnace burden; and the adoption of some device which will prevent the furnaces from throwing out dust.

The second course, the use of other ores than the fine Mesabi, is, probably, not possible, as the company has not, and could not at present procure, a sufficient supply of such ores. As to the third plan, while there are several devices for preventing the escape of dust, which have met with some success, opinion varies widely as to the best. The chief measures which have been tried are the use of a greater slope to the walls of the furnace above the bosh, in order to prevent slips; the closed top, and a special system of charging. The first involves a partial reconstruction of the furnace, which would be costly, while the result is not quite certain. The second has been tried, with considerable success, in some furnaces quite as large as those of the Jones & Laughlin Company. As to the third, there are several systems of charging which have been successfully used with fine ores. The company is a progressive and enterprising one, and there is little doubt that it will adopt some such devices as those suggested at its Eliza furnaces, and thereby secure their continued operation.

The case is another one of those arising from the apparently endless controversy between the demands of industrial enterprises, on the one hand, and the right, on the other hand, of owners of residential, or farming property, to enjoy its undisturbed use. It has been tried at Butte, at Ducktown, and other places, as well as at Pittsburg. The Butte cases were the cause of a long controversy, which was never really settled, though the copper smelters finally had their way. In the Ducktown case, the courts decided, in effect, that the industrial work was of such great importance to the district, that no minor interests could be permitted to stop it. The Pennsylvania court takes a different view, and upholds the rights of adjacent owners; though a minority of the judges, in a dissenting opinion, leaned toward the Tennessee precedent.

We do not believe that the decision will lead to any decrease in the demand for Mesabi ores, since their place cannot readily be filled. It will probably result in the adoption of some improved methods and devices in blast furnace operation, in Pittsburg and elsewhere.

FUEL BRIQUETTES IN THE UNITED STATES.

The manufacture of fuel briquettes is an industry of great importance in Europe, and is rapidly growing; but as yet comparatively little has been done in this country. About the only plant of importance making a commercial product is in California; and this is despite the fact that companies have been organized from time to time for thirty years or more, with the avowed purpose of revolutionizing the coal industry, by making a merchantable fuel, at great profit, out of some waste material, generally anthracite culm. These companies have failed, either because the organizers knew absolutely nothing about briquette making, or because the promoter or inventor was either dishonest or ignorant of the state of the art in Europe. As a result, the money invested was either practically stolen or wasted in purchasing especially designed machinery, that never worked as was expected, and had to be altered, re-arranged, or entirely replaced.

Just at present there seems rather more than the ordinary interest in briquetting—due, no doubt, to the higher prices for anthracite, resulting from the 1902 strike—and several engineers and companies are seeking to raise capital. Some of the capital secured will no doubt be properly spent, but some will as certainly be wasted if put into schemes now presented to investors in New York. We say this advisedly, for we have no confidence in so-called secret processes.

Every important mining camp in the West has seen secret processes that were to extract gold from ores that could not be profitably worked by existing methods, yet in practice simply extracted money from stockholders' pockets; and such processes are not unknown in the East. As a matter of fact, the general method of making coal briquettes is simple enough; the machinery needed has been brought to a high degree of efficiency by European and American inventors, and the success or failure of any given plant will depend simply on the cost of production, and the market price of good coal in the same locality. But those inventors and promoters who know the fascination which a new process presents to the ignorant investor try to put some mystery into the making of briquettes, by talking of secret compounds for binders, compounds far cheaper and more efficient than any in use, etc. Prospectuses of several such concerns have come to our notice lately. Undoubtedly some people will be victimized.

Readers of the Engineering and Mining Journal who are asked to put their money into coal briquette plants, will do well to read, on another page, some abstracts from a paper

presented at the recent meeting of the American Institute of Mining Engineers. The author has charge of the California plant, before mentioned, and is familiar with European practice.

THE ROASTING FURNACE DECISION.

According to press dispatches, a decision was handed down by the United States Court of Appeals at St. Louis, March 31, dissolving the injunction of the lower court restraining the Lanyon Zinc Company from using the Cappeau furnace on the ground that it was an infringement of the Ropp. This is a decision of great importance to the metallurgical industry, and especially to the zinc industry. Assuming that there be no important qualifications, it marks the end of a long contest.

The history of the case is briefly as follows: About six years ago, the Edgar Zinc Company and the Collinsville Zinc Company, which had acquired the rights to the Brown patents for use in blende roasting in certain States, brought suit against the Lanyon Zinc Company, which was using the Ropp furnace, on the ground that the latter was an infringement. A decision of the United States Circuit Court in 1899 was in favor of the plaintiff. The defendants carried the case up to the Court of Appeals and lost. Under stress of the injunction then decreed the Ropp furnaces in use at Iola and Laharpe were modified into what is called the Cappeau furnace, which the Brown people claimed to be still an infringement, and brought a new suit. They were again victorious in the lower courts, but have now lost on appeal.

A decision against the Lanyon Zinc Company would have compelled it to revert to the use of hand roasting furnaces until a new mechanical furnace could be developed, which would have materially increased its smelting cost, and would have temporarily reduced its production, its hand-roasting capacity being insufficient to meet the requirements of its retorts, while it would have been subject to large damages for the use of the Cappeau furnace. This would have been very serious to the Lanyon Zinc Company and would doubtless have had considerable effect in the spelter market, temporarily at least.

Until we receive the full text of the recent decision, we are unable to say how far reaching it is. The original decisions in favor of the Brown furnace appeared to be very sweeping and made it probable that several other well known furnaces besides the Ropp would be declared infringements of the Brown patents. This has greatly restrained the application of mechanical furnaces to blende roasting and most of the works erected during the last four years have been equipped with the old type of hand kilns. It appears now that the original decisions sustaining the Brown patents may not have been so sweeping as was thought.

THE HOSPITAL HILL SHALES.

This member of the Lower Witwatersrand beds in the Transvaal bids fair to become as great a bone of contention as the celebrated basalt of Stolpen, the castle-crowned hill in Saxony against whose rock-mass the tides of controversy ebbed and flowed more than a century ago. Werner would have it that it was of aqueous origin, a chemical precipitate in a universal ocean. It was thirty years before that rumination was dissipated, and it required Von Buch and D'Aubuisson to do it.

The whirligig of Time has brought a reversal of the controversy, localized on the Rand amid all the stimulating environment of a great mining industry, so that no time has been lost in threshing out the question whether certain shales, of stratigraphical importance in relation to the gold-bearing conglomerate, are of sedimentary or igneous origin. As a matter of fact they had been assumed to be sedimentary, and it was not until Mr. G. A. Denny threw his gauntlet into the geological arena that anyone supposed the matter required particular proof. As a consequence there has been an interesting discussion, in which Mr. Denny as a geological iconoclast has stood practically alone against such careful observers as Dr. F. H. Hatch, Dr. D. Dorffel, Mr. J. S. Curtis, and several other well-known men.

In support of his view of the matter, Mr. Denny made a large number of thin sections for the microscope and a series of chemical analyses, together with the necessary maps; in fact, he showed an industry which we are compelled to describe as worthy of a better cause. For it does not seem, in the light of evidence available at this distance, that his theory is demonstrable by facts.

Mr. Denny started out to prove that the Hospital Hill shales, including both the magnetic and non-magnetic, though iron-stained varieties, were of igneous origin. The similarity of these shales to those underlying the Kimberly Reef series throughout the Witwatersrand and underlying the Main Reef series on the East Rand, compelled him to include the latter in his theory. By going too far from his base he weakened the attack, for it became necessary for him to include rocks having a banded appearance due to those changes in sedimentation which are usually characteristic of the deposition of such material. The bands of fine grained shale could be seen passing into fairly coarse grained quartzite; in fact, these beds are known as "the banded shales underlying the Kimberley series."

On making slides of these shales and examining them under the microscope, they are found to be composed of angular fragments of quartz with an occasional fragment of plagioclose feldspar; the particles are almost all of the same size, and in appearance bear no resemblance in structure to a section taken from an igneous rock. A very little mica and some chloritic impregnation can be recognized now and again. When controverted, Mr. Denny proceeded to collect specimens and to make a large number of rock-slides, but being first a consulting engineer and only incidentally a petrographer, these slides were badly made; they were too thick and enclosed numerous air bubbles; some of the sections were from rock so decomposed that accurate identification was out of the question. These weak points were quickly recognized by specialists such as Messrs. Hatch and Dorffel. Dr. Hatch requested a loan of Mr. Denny's slides and then put his own determination in a deadly parallel with those of Mr. Denny, with results not far from humorous; for what Denny called "porphyritic diabase," Hatch called "quartzose slate," and what one termed "porphyritic dolerite with feldspar and olivine," the other labeled "quartzitic slate with fragments of quartz."

Then the question of analysis came up, and on this point even Mr. Denny's own results told against him, for in all the analyses of the shales the percentage of lime and potash never exceeded two per cent, whereas in the undoubted dikes it averaged, as it should, six per cent.

As viewed from afar, the theory which imputed an igneous origin to thin and persistent beds of shale amid a great thickness of quartzites seems far fetched, nor has discussion made it more substantial. In the West Rand there are areas of shale extending for miles, and throughout this region there are alternations of quartzite, shale, and quartzitic shale, all of them exactly conformable in strike and dip; in the approach to the basal granite the shales predominate, but thin layers of quartzite continue to be interlaminated without any sign of rupture or vitrification; nevertheless, the discussion elicited by this controversy drew out a good deal of information, and crystalized a large amount of amorphous thinking, so that it served a useful purpose.

THE SUIT AGAINST THE ANTHRACITE RAILROADS.

About a year ago the Interstate Commerce Commission, at the instigation of a notoriety-seeking owner of several newspapers, undertook an investigation of the methods of the anthracite railroads, particularly the reasonableness of freight charges on anthracite, the pooling of rates, and discrimination against individual shippers. The real object of the newspaper owner was evidently to elicit evidence that might afford basis for a suit under the Sherman act and give him a lot of advertising, whether the suit was successful or not.

The commission took much evidence, eliciting very little that was not already a matter of record. Attorneys for the railroads objected to the introduction of evidence that did not bear directly on the matter of rates, and in particular objected to the commission going into the

matter of prices for coal at the mines and at tidewater, on the ground that such testimony was irrelevant. The commission appealed to the United States District Court, and Judge Lacombe sustained the objections. Now, the United States Supreme Court has, on appeal, ruled against the companies and the testimony will be introduced.

The upshot of the matter is that the instigator of the suits has further chance to advertise himself, and the anthracite railroads will have to put in a defence. The Supreme Court decision is of importance in that it permits the commission, in determining the reasonableness of rates, to consider other factors than those relating directly to transportation. Hence the hearings in this and similar cases are likely to cover much more ground than formerly. As to the anthracite railroads themselves, the facts as to their control of mining and transportation are pretty well known to all persons familiar with the coal trade. If the daily press gives an acurate transcript of the evidence, these facts will be equally well known to the public at large. There is nothing to show, however, that the anthracite railroads will suffer, since the present conditions in the trade are the outcome of a long-continued struggle to make anthracite mining profitable, and it is not probable that any court will require any company to do business at a loss, nor is there any probability that any corporation can be compelled by law to cut the throat of another company.

MINING DIVIDENDS.

Dividend payments by companies engaged in the mineral industry of America in the first quarter of this year showed a grand total of $36,282,083, paid by 97 concerns. Twenty-six combinations contributed over 76 per cent, or $27,690,700, during a period when some of the larger iron and steel consolidations were compelled by a depression in business to postpone or reduce their regular dividend payments. Some combinations have considered it expedient to defer their 7 per cent preferred dividend. An exception is the Standard Oil Company, which divides among a handful of stockholders from 43 to 48 per cent annually, although in March it paid a quarterly dividend of 16 per cent, or $15,520,000. On the other hand, the United States Steel Corporation, the second largest dividend payer in the world, has 42,720 preferred stockholders to whom it pays annually 7 per cent, and in the current quarter disbursed $6,305,497. In all, there were 37 industrial concerns that paid dividends this year of $26,659,420, of which six were iron and steel works, reporting $7,490,207; 14 oil and natural gas, $16,585,082; 13 coal and coke, $1,978,381, and four chemical and mineral, $605,750.

The metal mines and treatment works, with considerably less capital than the industrial combinations, yield proportionately larger dividends to their numerous stockholders. Of the 60 mines and works reporting total payments of $9,622,663, there were 44 gold, silver and lead properties which divided $4,348,005; 11 copper, $4,903,331; four zinc, $311,327, and one quicksilver mine, $60,000. Usually the precious metal mines, capitalized anywhere from $500,000 to $3,000,000, pay monthly dividends, which in three instances—one Colorado gold, and two Utah silver mines—show an annual yield of 36, 39 and 40 per cent on the par value of shares that sell at much less than the 7 per cent cumulative preferred stock issued by the industrial combinations.

MARKET CONDITIONS.

April 6.

The metal markets are generally strong, and the improved feeling, noted last week, continues to be manifested.

Copper has been firm, and domestic consumers are showing an interest in the market, and an inclination to supply themselves. The foreign market has been quiet, on account of the Easter holidays. Prices here are again a little higher.

In tin there is but little change, either in demand or in prices.

Lead is quiet, with about the usual steady demand. There has been no change in the prices of this metal.

Spelter is strong, the demand from galvanizers being very good, while that from brass founders is improving. The Joplin ore market remains high, and buyers are competing for ore with the result of raising prices.

The silver market continues very quiet under the influence of light Eastern buying, and prices show little change.

The iron markets continue to show increased confidence, and a gradually rising scale of prices for raw materials. Pig iron and steel billets are selling well, and the same may be said of most lines of finished material, with the exception of structural steel and rails. The United States Steel Corporation pays the full dividend on its preferred stock for the past quarter, though it was not quite earned; but the statement of orders on hand shows an encouraging increase over that for January. Ore prices for the season are still uncertain.

The Western coal markets are in better shape, as transportation has improved. Lake shipments will be delayed this year, owing to the severe winter, and the trade will hardly begin before May.

The seaboard bituminous trade is moderately active, with prices lower than they were. Both car supply and transportation have improved, but the demand for coal increases very slowly.

In the anthracite trade the reduction of 50c. a ton, April 1, has brought out a very large volume of orders, and the capacity of the mines will be taxed for a couple of months at least.

METALLICS.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

The word coal is a popular, rather than a scientific term, being applied not only to beds of fossilized vegetation, but to other mineral substances capable of being used as fuel. The world's annual production has overlapped the 800,000,000-ton mark, of which more than one-third is supplied by the United States, followed by Great Britain and Germany.

Coal was first mined in the year 1113, by the monks of the Klosterrath Abbey, at Kirchrath on the Wurm, in Germany. It was first used on a large scale on the Tyne, in Great Britain, the "coaly Tine" of Milton. In 1239 King Henry III. is said to have granted a charter to the townsmen of Newcastle-on-Tyne for the raising of coal for fuel. In 1903 Great Britain increased her output to 230,323,391 long tons, of which 20 per cent, or 46,600,000 tons, was exported.

From 1821 to 1885 the utilization of natural gas was limited. In the latter year the subject was brought forward by Mr. Andrew Carnegie in a paper read before the British Iron & Steel Institute. About the same time natural gas was discovered in large quantities, and attained an extraordinarily rapid development for industrial purposes. In 1902 the United States alone consumed fully 200,000,000 cu. ft., or nearly 1.5 cu. miles, an amount sufficient to provide an annual supply of 15,000 cu. ft. for every family in the country.

Unless new mines are discovered soon, it is not unlikely that emeralds will become the rarest precious stones in the world. As the condition of the market is now, they are worth (in stones larger than five carats) from two to ten times as much as diamonds.

Combustible gas emanating in large quantities from fissures in the marl in the rock salt at mines in Hungary and Switzerland, has been used for lighting the workings. Gas collected from the fissures in cast-iron pipes has also been used for this purpose at the salt mines in Wieliczka. An outburst of gas in 1828 burned for some weeks with a flame 1.5 ft. in diameter, and the ancient records make frequent mention of these outbursts. Recently, however, the firing of the gas has been prohibited. Advance bore-holes are now driven to detect the occurrence of gas accumulations.

Although the city water supply of Hibbing, Minn., comes from a bed of iron ore, the water is so free from iron that it is used instead of distilled water in the analysis of iron ore.

In Russia the sludge acid from refining petroleum is utilized for the production of ferrous sulphate, the manufacture of soda by the Leblanc process, and the recovery of the contained sulphuric acid. As Russia is the largest oil-producing country in the world, the yield of sludge acid is enormous and its treatment as an individual industry should be very profitable.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the ENGINEERING AND MINING JOURNAL.

LABORATORIES FOR ADVANCED INSTRUCTION.

The Editor:

Sir.—It is to be regretted that limited space in the JOURNAL of March 24 prevented a more detailed exposition of the papers and discussions upon the subject of 'Laboratories for Advanced Instruction,' which were presented before the Institution of Mining and Metallurgy, since they contain many interesting, if not always practical, suggestions.

Judging from discussions, it would appear that this subject has not yet taken such definite form in England as it has in the States. Here it is generally considered that several of our laboratories are pursuing the proper course, and that acceptable changes will be in the line of additions to, and modifications of existing methods to the exclusion of anything of a revolutionary nature.

That any of our college courses or laboratories are perfect, or that the best features of all if combined would afford a perfect training, cannot be maintained. In fact, in my opinion, it is well that a considerable difference should exist between the methods used in our several mining schools. The use of slightly diverse methods to accomplish the same end is of great assistance in that healthy rivalry which should always exist for the benefit of instructors and students in our technical institutions.

In the States, the equipment of laboratories will continue to be designed largely on the lines most advantageous to a particular college, and this will depend to a great extent upon geographical situation, in spite of the fact that many of these institutions are striving for exactly the same end. The equipment of laboratories and the work of students is strongly tinged with the personality of the professors whenever men of high character are induced to become instructors. This sometimes may be unfortunate when the heads of all the departments are not equally forceful, and many of us are painfully aware of the excess of time that was put upon, say chemistry, electricity, mechanical engineering, or, perhaps, geology, to the detriment of other studies of equal importance. To avoid a disproportionate growth in any direction requires keen management on the part of the directorate of the institution. When advanced instruction, and the professors who are to give it, are guided by an intelligent and interested board of directors, or by an individual possessing the broadest grasp of the requirements, a well balanced state of affairs may be maintained that will be of inestimable value to the student body.

The equipment of a new laboratory must come by a process of evolution, by the addition of accessories that the yearly work shows are demanded to fill out the frame upon which the beginning was made. The experience that has been gained by equipping a large number of laboratories with useful and useless apparatus enables the latest institution to set up a frame-work well proportioned in all directions, and one that will stand the test of time. But it, too, must be flexible and capable of adapting itself to conditions as new as the institution.

How much success has been attained by our laboratories as educators is a mooted question; I would dare say that it is not one-half what some of my professional colleagues claim.

If young men ever knew in advance the line of work they would follow, the question of laboratory instruction and equipment would be much more easy to settle, but as only a small percentage can tell in what direction fortune will take them, it is impossible to predicate what will be the best course to choose at college. My experience in the management of advanced laboratory work, and since then in the life-work of the mining engineer, points toward one path of instruction that cannot be wrong, however many others may be right.

I disclaim any originality in the following observations, but rather wish to confirm the conclusions of others.

Every student who expects to be engaged in metallurgy, concentration, or mining should have practical work on a fairly large scale upon at least one ore. Whether it be an ore requiring the simplest form of crushing and concentration, one requiring pan-treatment, or the use of chemicals; whether it be a roasting or smelting ore, is in my estimation of little importance. The simplest treatment may be so easily varied to give good or bad results that it is unnecessary to adopt complicated methods in order to give the experience desirable.

What should be impressed upon the student is that there is some way of recovering the value in the ore. It may be at a profit, or it may have to be done at a loss; in any case he must be most carefully directed in reaching his conclusions. He must be shown that the process upon which he is working is capable of great modification, giving corresponding or perhaps disproportionate variations in results, and he will naturally infer that other processes, wherever he meets them, can be handled similarly.

For example, the student is given a simple ore. It is a low-grade gold-quartz, in which a part of the gold is free, a part in the sulphurets, and a part, for some unknown reason, has been lost with the tailings. Let him observe the effect of using a wide mortar and then the same mortar lined up until it is very narrow. Let him see the effect of discharging both back and front as compared with the front alone; let him note the result due to a change of speed, increasing and diminishing the drop, changing the screens, and the use of inside plates, as against amalgamating entirely outside of the battery. Make him realize that variations in such points as these, by their effect on the tonnage and the extraction, may turn a failure into success. Show him how to analyze his tailings so that he may determine where the gold is being lost and in what condition it exists, and from this lead him on to the proper size to crush his ore for maximum amalgamation and concentration. Point out the effect of classifying tailings before concentration, and, finally, instruct him in the handling of his slimes and tailings for the recovery of the values unamalgamated and unconcentrated.

When this is done, what has the student accomplished? Has he only familiarized himself with a single ore, such as may never again come under his observation? He has done this, but he has also done a great deal more. He has learned that the simplest processes are capable of endless modifications, he can see that by the ingenious use of his earlier knowledge of physics, chemistry and mechanics he can create a process to suit requirements, or, perhaps, he has learned that by no combination of known processes can he work profitably the ore that he is called upon to examine. While it appears to me to make but little difference upon what class of material the student works, I would equip the laboratory for treating the widest range of ores within practicable limits, in order that a number of ores may be worked upon at the same time by as many students, and in order that the students may see in operation as many different processes as possible, even if not actually engaged in carrying them through.

No laboratory will furnish the experience that one gets in practice, nor is that the province of the laboratory. The freezing of a large furnace, the breaking of a cam-shaft, the hundred and one accidents of the mill and smelter that have occurred and always will occur, must be encountered and overcome in the course of actual work. It is the province of the laboratory to teach lessons that in later years will greatly assist in enabling the engineer to adapt himself to new conditions, so that he learns to prepare a new ore for an old method, or an old ore to a new process.

In conclusion, it is my opinion that the laboratories under discussion should be equipped for the treatment of as great a variety of ores as may be practicable, this equipment to be determined largely by the experience already gained by similar institutions elsewhere; it should cover milling, concentration, chemical treatment, roasting and smelting. Then limit the advanced work of the student to one ore only; if the work upon this is carried out with care and attention, the student will never have occasion to regret this portion of his course.

FRED. F. SHARPLESS.

New York, March 30, 1904.

HEREDITY IN MINING.

The Editor:

Sir.—The following note may be of interest to your readers, as affording a good example of that hereditary instinct to which Mr. Purington referred in the course of an article published in your JOURNAL.

N. T. is a son of S. T., a well-known Cornishman, miner and mine captain in the San Juan country in Colorado. His father writes that "Some of my people away back were miners, but not so on my wife's side. N. was always 'stuck on' a hammer and used it ever since he was a year old, and picked up all the old nails he could find when I took him in the mill before he could walk."

He was not, however, allowed to play with a hammer until a short time before I saw him last. In fact, I had seen him very often, and had never seen him in possession of either hammer or nails.

On the occasion I refer to, he was 27 months old, and as much of a baby as is usually a child of that age. He had a small tack hammer; the head probably three-eighths in diameter (not more). With this he was busily driving tacks in a board, keeping at work for an astonishingly long time, I should think three-quarters of an hour! I watched him constantly. He held his hammer well, and with his feeble blows usually needed from 12 to 20 to drive down a tack. About every third or fourth tack he missed one blow; the blows immediately succeeding were usually not misses, but were less well given. Occasionally he at-

tempted voluntarily to drive a small wire nail two or three inches long. His strength was insufficient to force this in more than half way. When it began, instead, to bend from his blows he would pull it out with great deftness and summon some one to straighten it for him.

X. Y. Z.

Telluride, Colo., March 22, '904.

LOGICAL METHOD OF VALUING PROSPECTS.

The Editor:

Sir.—The desirability of formulating some method which would give more uniformity in the valuation of undeveloped mineral prospects has often been expressed in your columns.

The estimation of the value of a prospective mine depends: first, on a knowledge, by education and experience, of ore deposits in general, and, second, on a knowledge, by reliable reports and personal observation, of the degree of permanence and certainty associated with the particular type of deposit in the particular district to which the prospect under consideration belongs.

The mining operations and geological features of the district may make it reasonably certain that the ore under consideration occurs as a more or less uniform bed or vein, a more or less regular shoot, a zone of enrichment, a lens or series of lenses, an irregular mass or stockwork, or it is of some other particular form or character. Beyond this, and the size and richness of the outcrop, we usually have no certain information, and it is not likely that any knowledge of ore deposits will ever be able to compute with certainty the quantity and quality of undeveloped ore. We therefore have to resort to a mean probable valuation.

If we select, from the district in question, all the mines and past, present, prospective, deserted or unappropriated prospects, the surface showings of which were equal to, or some a little better, and an equal number a little worse than, though being of the same general character as, the one in question, and if their present values added to the profits already realized be respectively I_1, I_2, I_3, etc.; then by having opened all these mines and prospects to their present state, we should be $I_1 + I_2 + I_3 +$ etc., to the good. Therefore (putting their number $= n$) by opening one of them we stand a mean chance of being

$$\frac{I_1 + I_2 + I_3 + \text{etc.},}{n}$$

to the good. To this may be added or from it subtracted a percentage to allow for the advantages or disadvantages of position or location of the prospect in question over the average prospect or mine among those considered in deducing this mean probable valuation.

The following table will illustrate the method, the deductions being made for those prospects which have had more legitimate expenditure in development than they have realized, or could be expected to realize:

Take	1	prospect	or	mine	at	$100,000 =	$100,000
"	2	"	"	"		30,000 =	60,000
"	7	"	"	"		5,000 =	35,000
"	15	"	"	"		1,000 =	15,000 $210,000
Deduct	20	"	"	"		1,000 =	20,000
"	5	"	"	"		10,000 =	50,000 70,000
Total	50	"	"	"			140,000
Mean	1	"	"	"		probable value =	$2,800

The figures may alter our opinion of many of the similar prospects, hence we may obtain a second degree of approximation as follows:

Take	1	prospect	or	mine	at	$100,000 =	$100,000
"	2	"	"	"		30,000 =	60,000
"	7	"	"	"		7,500 =	52,500
"	15	"	"	"		2,600 =	39,000 $251,500
Deduct	20	"	"	"		1,000 =	20,000
"	5	"	"	"		10,000 =	50,000 70,000
Total	50	"	"	"			181,500
Mean	1	"	"	"		probable value =	$3,630

Simple variations of this method will suggest themselves when all the croppings of the developed bodies are larger, smaller, richer, or poorer than the one in question, but when there are no developed bodies of a similar nature in the district, means must be struck from observations on the whole region, in which case care must be taken not to omit districts which have failed to produce mines.

In using the above method the personal equation will still exert itself, but, combined with competent skill, the method ought to banish the personal defects of rashness or despondency, inflexibility or disproportion and preconception or pertinacity, which are responsible for the enormous discrepancies of judgment usual in this, as in all highly speculative, business.

Blamey Stevens.

Valdez, Alaska, March 10, 1904.

VALUING METAL PRODUCTION.

The Editor:

Sir.—In the discussion under this head, published in the Journal of March 31, there is a basis of truth, and its claims might be admitted on theoretical grounds. It would be a very desirable condition if we could carefully apportion the value of all mineral and metal products as "R. W." wants to do; so much to the mine from which the ore is taken; so much to the mill, where it is concentrated, or otherwise treated; so much to the smelter, who reduces it to matte, bullion, or other metallic form, and so much to the refiner, who puts the metals in final form for use or sale.

To make such an apportionment, however, would require time, labor and a certain amount of inquisition into private business, which would hardly be practicable under existing circumstances. The various agencies which now exist for the collection of mineral statistics would not be competent to the task. The time required for collecting and arranging those statistics would be very much extended, and their publication delayed. If we were satisfied to receive our mineral statistics as they do in France and Germany, a year and a half, or two years, after date, we could have them with all the refinements and subdivisions which "R. W." would, apparently, like to see. Now, early publication, as a rule, gives much more value to statistics than absolute accuracy or careful apportionment of profits. A close estimate of the production of any important metal or mineral, which is accessible three months after the close of the year, is of infinitely more service to the miner, the dealer or the manufacturer, than an absolutely correct statement a year later. If we are to wait to cipher out and apportion values we might as well go out of the business of collecting and publishing statistics, so far as they are to be of any practicable service.

For myself, I do not attach any particular importance to values in a statistical statement of mineral production; and I think a great majority of those who are most concerned will agree with me on that point. The quantities are the main thing, and most men who are interested can supply the values for themselves. After all, the main use of the values is as a sort of counter by which we can arrive at totals. One cannot very well add together ounces of silver and tons of iron ore, so that to reach a total we take the approximate value, and are so able to obtain an expression which gives an idea, comprehensible by the popular mind, of the total amount of the mineral production and its importance. In any table of values of this kind, we must make certain arbitrary assumptions, in order to avoid going into endless detail. In stating the price of metals, it is necessary to adopt some standard, and the only standard which is readily and conveniently accessible, and generally recognized, is the price of those metals at some central selling point like New York. It is true that in doing this there is probably a little overstatement, which, however, is not of serious importance. If we once begin to make allowances for smelting charges, freight charges, and the like, we are lost. These charges differ very widely in different places; they differ in the same place from time to time, and the endeavor to equate and average them would lead us into endless assumptions, and in the end land us far further from the truth which we started out to reach than we would be, if we had taken the New York price with which "R. W." finds so much fault. Leadville or Cripple Creek may be credited with a few dollars more, perhaps, than is its just due; but the expression of the total mineral product will be very much nearer the truth.

To put it in a little different form, the counter or symbol, which represents a certain product in the general table—for that is all values amount to, anyway—must be the same for all producing districts, and the only way in which we can secure this similarity is to adopt a uniform standard. The only standard we can safely take is the selling price.

In the special case quoted by "R. W.," there is a well-known reason for the difference. The Leadville miner does not sell his ore by the ton; he sells the metals contained in the ore, and payment is made him on the basis of those metals. The Joplin miner, on the other hand, sells his ore, or rather his concentrates, to the buyer direct, and does not concern himself with the price of the contained metal, except indirectly, as it may affect the buyer's bid for the ore. The Leadville miner sells so many ounces of silver and so many pounds of lead; while the Joplin miner sells so many tons of concentrates, not so many pounds of spelter.

Upon the whole "R. W.'s" comunication

reads to me more like the contribution of a technical school graduate, overcome by the stupendousness of his own knowledge and his own exact ideas, than like the statement of a practical man with some knowledge of business and its conditions. I may be doing him an injustice, but that is the way it looks to

New York, April 4, 1904. INVESTOR.

THE IRON ORE DEPOSITS OF VARANGER, NORWAY.

By H. LUND.

These deposits are in the northeastern part of Norway on the south side of the Varanger Fjord, the nearest town being Vadso. The average distance to a good harbor is 8.5 km., although some of the deposits are close to the sea. The ore is magnetite, with hornblende and quartz. It is found in a gray gneiss, near a large occurrence of granite. Quartzite and gabbro are also met with. The dip of the ore beds is about 70°. The origin of the ore, according to some experts, who have examined this region, is most probably due to magmatic differentiation.

There are a number of single deposits, or lenses, most of them having a considerable length, and varying in width from 1 to 150 meters. The average is between 20 and 30 meters. A rough estimate of the surface area so far shown is 1,000,000 sq. meters.

The ore is hard, strongly magnetic and has a specific gravity of 3.6. In some of the beds the ore is mixed mainly with quartz, while in others the hornblende predominates. It is not a high-grade ore, the iron-content varying from 30 to 58 per cent. A general average may be taken at 40 per cent iron; the phosphorus runs about 0.04, sulphur 0.013, manganese 0.3, and titanic acid, 0.14 per cent.

The conditions of work are favorable, as a tramway and shipping dock could be built at moderate cost. The climate on this coast is not so severe as in other parts of Norway. In winter, however, there is some ice in the fjord, so that an ice-breaker or tug capable of cutting through the surface ice would have to be provided. This could be avoided, however, by extending the tramway 10 km. to the mouth of the fjord.

As most of the ore is rather lean for shipping, it would probably have to be crushed and concentrated by magnetic concentrators, such as are now in use at many Swedish mines. The cost of concentrating in Sweden is moderate, being usually about 25 to 30c. per ton of raw ore. At Varanger abundant water power can be secured, about 5 km. from the ore deposits, so that the cost of concentration could be kept down. By this concentration, the iron content could be brought up to from 58 to 65 per cent, while the phosphorus would be reduced to 0.01 per cent. If the concentrates are made into briquettes, it is calculated that the cost of these briquettes would be about $2.10 per ton, f. o. b. Varanger. Freight to English ports would be about $1.30 to $1.40 a ton, making the cost of ore delivered at a British port about $3.50 a ton. The cost delivered at American ports would be.

LIGNITE PRODUCTION IN BOHEMIA.—The production of lignite in Bohemia in 1902, though somewhat smaller than in 1901, amounted to 18,217,813 metric tons. Over four-fifths of the production comes from the mines about Teplitz and Brüxer. The mines gave employment to 36,388 persons.

MINING IN CORNWALL.

In the course of a presidential address before the Royal Geological Society of Cornwall, Mr. J. H. Collins referred to the important educational work done by the local mining schools and spoke, with natural pride, of the mining work done by Cornishmen in different parts of the world. He went on to say: "If at home they are somewhat slow in taking up and applying new inventions and new methods, it is much more from want of money than from any lack of brains or enterprise, and we may reasonably exult in the fact that at the present moment a considerable proportion of the leading mines and reduction works of the world are controlled, either as managers or foremen, by Cornishmen who have been trained in the old county.

"During the life of the Society, mining generally, and the mining industry of Cornwall in particular, has experienced many changes. Copper mining, already an important industry in the west of England in the earlier years of the nineteenth century, increased until it reached enormous proportions, and has since shrunk almost into insignificance. The much older tin-mining industry has, on the whole, flourished in spite of extraordinary discoveries and developments in the East Indies, in Australia, and in Bolivia.

"Lead mining, once of great importance in the West, has now come to an end. The mining of iron and zinc, arsenic and wolfram, had from small beginnings increased to considerable dimensions, and has now once again become almost extinct. But the working of china-clay and china-stone has, to some extent, restored the balance, so that the total mineral production of the West of England at the beginning of the twentieth century compares very favorably with the similar total of 1801, although the number of persons employed in connection therewith has very greatly increased.[1]

"The improved winding appliances; the introduction and abandonment of the man-engine; the employment of wire-rope instead of chain or hemp-rope, making the safe use of skips possible; the now universal use of safety fuse; the general substitution of 'high' for 'low' explosives; the introduction of boring machinery; the improvements in ore-crushing and dressing machinery—all these are well within the memory of some who are still among us. One need only mention the Blake stone-breaker, the California and Husband stamps, the revolving frame, the Frue vanner, and the Wilfley table, to show the contrast between now and then. Some of those present may have seen the new oil process in operation at Tywarnhaile; if so, they must have been suprised at its unexpected and scientifically, and, it is to be hoped, commercially, successful results. I say 'unexpected,' because it was not to be foretold that by mixing oil and water, mineral and veinstone together, the light oil should float up, so to speak, the heavy ore material and leave the lighter veinstone behind. It is unfortunate that so far the process has proved itself entirely inapplicable to the treatment of tin ores.

[1]At the close of the eighteenth century the annual value of the minerals raised in Devon and Cornwall was something under three-quarters of a million sterling; about the middle of the century it was nearly one and three-quarter millions; it is now over one and a quarter millions. In 1902 the production and value were as under:

	Tons.	Value.
Metallic Minerals.....	17,451	£551,961
Non-metallic Minerals.	1,816,145	678,819
Total	1,834,296	£1,230,780

The great success, at the Clitters mine, of the Wetherill magnetic machine for separating tin and wolfram is also worthy of notice, and should serve as an object-lesson in other quarters.

"We have seen with great regret the abandonment of mining throughout whole districts and the practical withdrawal of most of our local magnates from mining pursuits. Yet we know that very few, if any, of the great lodes have been really exhausted, and we may still hope that a time will come when, with larger organizations, possessed of capital sufficient to enable them to live through periods of low prices, to work on an extended scale, and to provide modern machinery and appliances, most of these abandoned districts may be again busy mining centers. And one cannot help seeing that the coming of the good time will be hastened if the owners of mineral lands generally can be brought to see, as some have seen already, that it is not only their interest, but also an absolute necessity, if home mining is to continue, that all mining leases should contain a provision that dues shall not exceed a reasonable proportion of profits, and that when there are no profits there shall be no dues."

COAL IN NOVA SCOTIA.—Shipments of coal from all Nova Scotia mines in 1903 were 4,650,000 tons, an increase of 305,000 tons over 1902. Of the total last year, the Dominion Coal Company's mines furnished 2,802,134 tons.

CANADIAN IMPORTS OF MINING MACHINERY.—Imports of mining machinery and wire-rope into Canada for the year 1903 were valued as follows:

	Machinery.	Wire-rope.
From United States.....	$1,206,465	$60,676
From Great Britain	61,425	119,135
From other countries	13,295	6,153
Totals	$1,281,185	$185,964

The value of mining machinery imported shows an increase of $429,846 over that for the previous year.

ELECTROLYTIC ANALYSIS OF GOLD.—At a recent meeting of the Faraday Society, Dr. F. M. Perkins and Mr. W. C. Prebble gave the results of researches to arrive at an electrolytic method of estimating gold which should be perfectly accurate, and yet far more rapid than the ordinary double cyanide method which the authors, differing from Classen, consider inordinately long, even in hot solutions. Solutions of sodium thiosulphate, cyanide, sodium sulphide, potassium thiocyanate and ammonium thiocyanate were all tried and the results compared. The first-named was useless; of the others—which are all accurate—the thiocyanates gave the best results and the ammonium salt was better than the potassium. With currents of 0.2 amperes per sq. dem., the deposition of 0.05 to 0.08 gms. of gold was complete in 5 or 6 hours. With a current of 0.4 to 0.5 amperes, 1.5 to 2 hours sufficed. The presence of a little persulphate considerably reduced the voltage required. Experiments were also made to determine the best method of removing the deposited gold. Chlorine or bromine water was satisfactory, but slow; aqua regia was risky; the authors recommended a 2 per cent solution of potassium cyanide containing a little hydrogen peroxide or a persulphate. One or two minutes then sufficed to remove the gold.

GOLD MINING IN KOREA.

By H. C. Perkins.

Old workings indicate that gold was produced in Korea before foreigners from the western nations were admitted into the country. Until the advent of the American miners, less than ten years ago, the mining methods continued to be of the most primitive character, such as were probably employed thousands of years ago. The greater number of the gold veins and placer veins are situated in the northern part of the Korean peninsula. The land rises from the sea to heights of three and four thousand feet and is deeply channeled by water-courses. These have made precipitous hills and broad, flat river-beds. On the hills there is usually a fair quantity of pine, oak and maple, the trees affording good fire-wood and timber of ordinary dimensions. Large mill-timbers are brought from abroad.

The latitude of Korea extends from 34° to 43° North. The climate is vigorous and healthy; cold in winter and hot in summer, not unlike that of New York State.

Previous to the coming of foreign miners into the country, the ore from the veins was extracted to very limited depths by the use of a crude gad and hammer; the ore obtained was crushed under rocking stones and the metal panned from the resulting sand. No attempt was made to save the gold when intimately associated with base minerals.

The placer mines are in the modern river-beds. They are worked by the most simple methods of excavation, and the gold is obtained by panning the richer portions of the deposit. The dredging system is sometimes followed, the dredge being a wooden bucket attached to a well sweep-arm, which is operated by manual labor.

TABOWIE CAMP AND MILL, KOREA.

The United States Mint reports give the gold yield of Korea, as follows:

1900	$4,500,000
1901	4,500,000
1902	3,500,000

The source of information upon which these figures are based is not such as to give them much weight. The people of Korea are so poor that little gold is used in the arts, and there being no tax upon it, no important amount is likely to be carried out of the country through any but the regular banking channels; therefore the customary additions which are added to known quantities are likely in this instance to exaggerate the yield. My opinion is that the above estimates of the output are too high. At present but one enterprise in Korea, operating under modern mining methods, is producing any considerable quantity of gold.

Korea will be a gold producer of importance for many years; vein mining on a large scale is only starting and the placer deposits, which are very extensive, are likely to yield largely when they are attacked by modern dredging methods. There are copper deposits rich enough to be worked by the natives in the northern part of the territory. Coal of an inferior quality is found both on the east and west coasts.

My observations extended over only the northwest portion of the country, where I found the veins almost exclusively in granite, and although dikes are not infrequent, the veins are not often seriously faulted. Workings have already reached a maximum depth of 1,000 ft. below the outcrops. The gold-bearing lodes are generally well mineralized with the sulphides of iron, lead and zinc, but they are only occasionally of such size as to justify any considerable outlay for their exploitation.

MAIBONG CAMP, KOREA.

At present there is a German, an English, and an American company at work upon mining concessions; the last mentioned, known as the Oriental Consolidated, being the only one that has reached a productive stage. This company is operating five California stamp-mills scattered over 250 square miles of territory, employing in all 200 stamps, which crush 18,000 to 20,000 tons of ore per month. The working costs are about $2.25 per ton; this cost is low, considering the existing conditions, as low as the expenditure on similar work in the United States. Miners' wages are 25c., gold, per day, or about double the ordinary daily wages of the country. This is the first instance which has come to my knowledge where the costs per ton for gold mining have been as low in a low-wage locality as in the United States and other high-wage countries. Mining men usually expect that the working costs will not be low in a locality where the inhabitants are inexperienced in mining work. Education is slow and costly, and it is almost an axiom that mining cannot be done profitably in a new country unless the ore deposits are of exceptional richness or of unusual extent. In the one case economy is not essential to success, and in the other the aggregate value justifies the expense and time required for establishing the business on a paying basis.

The excellent economic results achieved in Korea have been due chiefly, in my opinion, to the skill of the projector of the enterprise, Mr. Leigh Hunt, aided by the present manager, Mr. H. F. Meserve. At the very inception of his enterprise Mr. Hunt adopted the principle of employing almost exclusively the labor of the locality, rather than that of importing skilled talent for the work. Six years ago the Korean had no knowledge of any of the modern mining methods or appliances; he wedged out the surface ore with a gad, conveyed it in baskets, crushed it under stones and washed it in his pannakin. To-day he drives tunnels, sinks shafts, stopes ore-bodies, timbers and

manages hoisting engines, all with sufficient skill to produce excellent economic results.

When I visited the property two and one-half years after the beginning of work upon the concession, the plant consisted of one 20-stamp mill; the costs had been under $5 per ton, and the capital employed in the inauguration of the enterprise had been quite small. At the outset Mr. Hunt placed himself in a sympathetic attitude toward the natives with whom he had to deal. He looked beyond their bad qualities, which are slow to mend, to their good ones, which he used at once. He gave to Koreans the same justice his own race would have expected to receive, and employed them, as far as was reasonably possible, in preference to foreigners.

Now that Americans are beginning to inaugurate enterprises in foreign countries, it is most important that they should grasp the principles which, if followed, lead to economic success, and therefore it is that I wish to call attention to the general methods employed by Mr. Hunt in Korea, with such excellent results.

TARACOL CAMP, KOREA.

EAST GALICIA OIL-FIELD.—In the *Zeitschrift für praktische Geologie,* March, 1904, Dr. Rudolf Züber describes the Opaka-Schodnica-Urycz oil-field in East Galicia. This field lies about 9 km. southwest of Karpapatenrande, and covers an area about 12 km. long by 400 m. wide in the middle. The rocks of the surrounding district belong to the Cretaceous and Tertiary formations, and include limestones, sandstones, shales and claps. They are, as a rule, steeply folded, and along either side of the narrow productive zone, which runs northwest and southeast, is a fault, the throw of which increases going toward the southeast. The first exploration for oil in this region dates back over 20 years, the whole production in 1881 being 15,680 qtl. of 100 kg. In 1900 the production reached its maximum of 1,850,000 qtl.; in 1901 it fell to 1,650,000 qtl., and since has greatly declined. In the whole district, over 600 productive bore-holes have been put down. There are two oil horizons, the first a sandstone, 30 to 40 m. thick, separated from the second, also a sandstone, and 60 to 80 m. thick, by 100 to 150 m. of clays and sandy shales.

THE EQUIPMENT OF MINING LABORATORIES.

By Henry S. Munroe.*

The equipment of laboratories at schools of engineering, which was recently discussed by the Institution of Mining and Metallurgy, presents many difficult problems. The equipment of mining and metallurgical laboratories, in which we are chiefly interested, can best be studied as a part of the larger question.

The objects of laboratory teaching for the training of young engineers may be summarized as follows:

1. To give opportunity for the experimental demonstration of the underlying physical and chemical laws, and general fundamental principles of any given branch of engineering.

2. To train the student to make scientific engineering tests of the performance and efficiency of machines and processes under working conditions, or tests of the qualities and properties of materials to be used or treated, so that he may be prepared to make such tests intelligently and with accuracy in his professional work later.

3. To afford opportunities for original investigation and research.

Under the first head, the object of laboratory teaching is to supplement the class-room work and add to its efficiency. Under the second head, the object sought is chiefly the training of hand and eye in laboratory manipulation, while under the third head the purpose is to add to the sum of scientific and professional knowledge.

One important question to be decided is the scale of operation—shall the work be done on a small scale with laboratory apparatus, as in chemical and assay laboratories? Or shall we introduce full-sized machinery and attempt to reproduce actual working conditions in laboratory work? Or shall we adopt some compromise scale for our apparatus and methods?

The study of physical and chemical phenomena usually can be conducted as well on a small scale as on a large one, provided our instruments and methods are sufficiently delicate and refined.

The testing of engineering materials and the determination of the chemical constitution and physical properties of minerals and ores can be done as well on a small scale as on a large, if only we can secure small samples for our tests that will fairly represent the larger amounts to be treated.

The testing of machines and processes can sometimes be done on a small scale, but the results of such small scale tests are often of doubtful value, and generally need to be supplemented and confirmed by tests on a large scale.

Work on a laboratory scale requires less room, less expensive apparatus, and takes less time and much less work than large scale operations. Small scale work is thus much to be preferred when results of equal value can be secured thereby. On the other hand, large machines and full scale working tests are sometimes indispensable, and in such case must be provided at any cost.

For example, let us consider the necessity for, and the proper equipment of, mechanical[1] laboratories in a mining school.

1. In mining, as in other industries, machinery is to-day more and more replacing hand labor. This is pre-eminently an age of machinery and of mechanical devices by which labor is rendered more effective.

2. Mining engineers are called upon to design machinery for mining purposes, and to superintend its construction and operation. Engineering tests of materials of construction, and tests of efficiency of machines under working conditions, furnish the data for design and construction. Again, in the operation of machinery the function of the engineer is to see that the machines are in proper adjustment and that they are working efficiently and with economy, for which purpose also accurate tests are needed.

3. The object of installing large machines in the laboratories of an engineering school is then to enable us to train the student to adjust and operate machines and to make tests of efficiency of such machines under similar conditions to those of actual practice. This involves the use of instruments of precision, and instruction in correct methods of physical, mechanical, and mathematical investigation. This training should be of a high order, as not infrequently the problems to be solved by the engineer in his professional work are of great difficulty, and may even involve extended research in new fields in pure science.

4. The making of such engineering tests is, then a necessary and important part of the training of the young engineer, and if this instruction be omitted or slighted, he will be but imperfectly fitted for professional work. A mining engineer, for example, should be able to test, among other things, the efficiency of boilers, steam and gas engines, air, hydraulic and other motors, pumps and compressors, electric lighting and power plants, telephone and telegraph systems, crushing, concentrating and amalgamating machinery and metallurgical plant, and to determine in each case whether the motive power, coal, gas, water, air, or electric current, is economically used, and the machines and mechanical devices are working to the best advantage. Or, if this is not the case, he should be able to diagnose the trouble and indicate the remedy and determine the conditions of maximum efficiency and economy.

5. While it is possible to describe such engineering tests, and even to illustrate them

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[1] Including under this head electrical, hydraulic, air, steam and gas motors and machinery, etc., etc.

in a measure by laboratory apparatus on a small scale, such descriptions and illustrations should be supplemented by actual performance of the work on full-sized machines, operating as nearly as possible under normal working conditions.

6. Full-sized machines are necessary for such tests because the elements of linear dimension, of surface area, of volume and time, influence the results materially, and often to such an extent that the desired purpose either cannot be secured on the small machines, or can be produced only by so varying the conditions of work as to give false and misleading ideas that may work great mischief.

7. Engineering tests on full-sized machinery can be made to better advantage in the laboratory than in the field, or in the works, for the following reasons:

a. The time of the student and of the instructor is economized. To obtain access to such machines the student must visit many works in more than one locality, and consume much time in traveling to and from the school, or from place to place. In the laboratory the instructor can direct the work of many students, working singly or in parties of two, three, or half a dozen, on different machines; but if the tests are to be made in different works, a larger force of instructors will be required.

b. The conditions in the laboratory are more favorable for such tests. The necessary facilities, auxiliary apparatus, and instruments of precision are at hand, and the instruction is better organized and more efficient.

c. The large machines in the laboratory may be especially designed and arranged to facilitate such tests. In the works this cannot always be done without extra labor both to student and instructor, and expense to the works, and even then the results are likely to be less satisfactory, at least from the educational standpoint.

d. In establishments where the machine is doing its regular work, it is usually impossible to vary the working conditions as in the laboratory. The instruction is, therefore, more limited in range, and the less valuable on this account.

e. In the works the machines are generally kept in good order and adjustment. In the laboratory it is possible to show the effects of unfavorable conditions, and to give the student clinical instruction, similar to that given to medical students.

f. Finally, it would be impossible to secure, even in part, the facilities enjoyed in the laboratory, without imposing a serious burden on the courtesy and good will of those in charge of the works, nor without throwing on the works trouble and expense that should properly fall on the school.

These points, in their application to ore dressing laboratories, can be illustrated by giving some details of the equipment of the mining laboratories of the School of Mines, and by an outline of the laboratory work which we are now requiring of students.

The mining laboratories of the School of Mines are equipped with full-sized machinery for crushing, sampling, and concentrating ores, and with small laboratory apparatus for quantitative working tests on a laboratory scale. Machines and apparatus of half or quarter working size, which characterize the equipment of some other laboratories, find but little favor with us. We have also avoided the common mistake of erecting a small mill for laboratory use, necessitating the running of a number of machines simultaneously. We believe that in a laboratory machines are best operated singly, as this not only simplifies equipment, but also makes the single machine more useful for laboratory purposes.

Full-sized concentrating machinery is found in most of the recently equipped mining laboratories here and abroad, but the method of using such full-sized machines at Columbia is original and differs materially from the usual practice at other institutions.

The ore dressing laboratories at Columbia are designed to serve four purposes: 1. To illustrate the physical laws bearing on mineral separation. 2. To afford opportunity for quantitative working tests. 3. To train students in the adjustment and operation of concentrating machinery, and in the making of efficiency tests under working conditions. 4. To give advanced students and others all necessary facilities for original investigation.

As we have already seen, the first and second of the above objects, and to some extent the fourth, can best be attained by work on a small scale. For this purpose one room is equipped with simple laboratory apparatus and small model machines. In this laboratory the student makes hand-picking, hand-jigging, and vanning tests on small quantities of ore, and is taught the method of panning gold-bearing gravel. He also makes quantitative tests with laboratory jigs, classifiers, and slime tables, small models of the large machines, with facilities for the accurate adjustment of all working conditions. Much of this apparatus has been especially designed for the purpose. We are planning to add similar laboratory tests in magnetic concentration, in amalgamation of gold ores, and in oil concentration. All the machines in this room are made as small as practicable and are really of laboratory size.

For working tests on larger quantities of ore we have a keeve, or dolly tub, and a square buddle, and expect to install shortly a one sieve vanning jig. By the use of such simple apparatus, easily extemporized anywhere, lots of ore from one ton to one hundred tons can readily be concentrated and the necessary data secured at small expense for the design of a more elaborate dressing plant.

For the third object above specified, viz., to train students in the adjustment and operation of concentrating machinery, and in the making of efficiency tests under working conditions, and to provide advanced students and others with facilities for original investigation of ore dressing problems, we have installed examples of different types of crushing, sampling and concentrating machinery. These are full-sized machines in nearly all cases and are of the types with which the young mining engineer should be familiar.

The crushing and sampling laboratory contains conveniences for crushing and sampling large and small lots of ore, including a small Gates crusher, a Krom high-speed jaw crusher and Krom high-speed rolls, a sample grinder, ball and pebble mills for fine crushing, gyratory screens, a Vezin automatic sampler, and laboratory crushers, bucking plates, hand sieves, riffle samplers, etc. The concentrating machinery includes three Harz jigs of two, three and five compartments, a Hooper air jig, two round tables, concave and convex, a Frue vanner, a Wilfley table, and a Stein-Bilharz belt table. On the lower floors are full-sized classifiers, settlers, automatic feeders, and centrifugal pumps for supplying these machines with water and ore for continuous work.

The concentrating machines are all arranged to be run continuously, all day if necessary, without requiring large amounts of either water or ore, the same material and the same water being used again and again. The ore and water-supply and the mechanical details of the machines are arranged to permit easy and accurate adjustment of any and all working conditions.

With each of these machines the student makes a series of experiments designed to bring out the physical laws governing successful working, to afford instruction in practical details of operating the machines, and to give opportunity for engineering tests of capacity and efficiency under different conditions of treatment.

These include the adjustment and regulation of the ore supply, of the feed and wash water, of speed, stroke, and other working conditions to the treatment of different ores and different grades of sand and pulp. In this work the student is taught to recognize the symptoms of irregular working, to diagnose the trouble with the aid of laboratory tests, and to apply the proper remedies. He makes, incidentally, numerous tests of capacity and efficiency, taking frequent samples of ore-feed, and of the different products for quantitative examination, and weighs and measures the ore and water supply and products obtained.

Experiments of this kind cannot well be made at the works for purposes of instruction. Here the machines must work regularly and without interruption, and any interference with the ore-feed, water-supply, or other adjustments may occasion loss of valuable mineral. Arrangements might perhaps be made to reimburse the management for such losses, but, in addition to this, the machines themselves often would have to be modified at considerable expense to permit the necessary adjustments and to facilitate the taking of samples and measurements, and laboratory facilities would have to be provided at additional cost, at each of the establishments visited by students for this work.

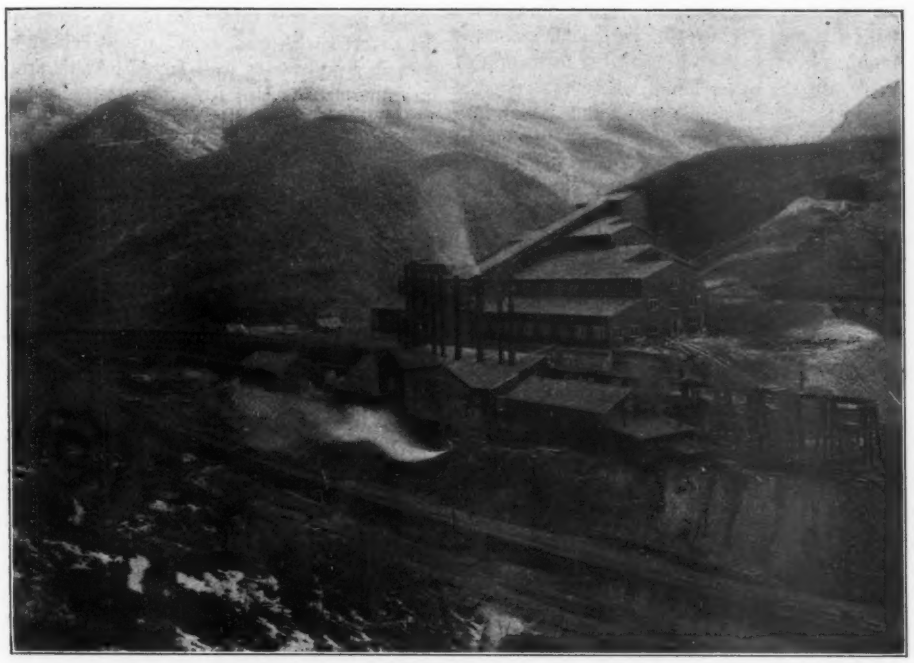
The installation of working machines in the engineering school has, incidentally, other advantages. For example, they not only illustrate the lectures on engineering subjects, but in addition serve in the place of much descriptive matter, details of construction, adjustment and operation, with the advantage that the students' conceptions are clearer, false impressions are avoided, and the instructor has more time to devote to critical discussion. Finally, a proper equipment of engineering laboratories should be such as to enable the staff and advanced students to undertake important original investigations of ore dressing questions, many of which await solution. A beginning has been made, at Columbia and elsewhere, in this direction, and it is hoped that much valuable work of this character may be accomplished in the near future. In many cases the machines in these laboratories have been especially designed to facilitate such researches.

The peculiar fracture of tungsten steel is one of its marked characteristics, and is not possessed by any other steel. This fracture is described by the steel-makers as 'silky.' It does not show well when the alloy is very low in carbon, but appears best when there is 1.4 or 1.5 per cent carbon in combination.

THE NEW MILL OF THE UTAH COPPER COMPANY.

BY OUR SPECIAL CORRESPONDENT.

The new concentrating plant of the Utah Copper Company is situated on lower Bingham cañon, Salt Lake county, Utah. A spur from the Bingham branch of the Rio Grande Western railroad extends over a trestle, and the cars of ore are dumped into the bins beneath the tracks. The ore is taken from the bins through chutes to a belt conveyor, which delivers it to the crushers, the latter being on the lower floor of the mill, a few feet higher than the bin chutes. The ore passes through the No. 6 Gates crusher, and is thence elevated to a revolving screen having 0.75-in. openings. The oversize from this screen is re-crushed by a No. 4 Gates crusher, the undersize being carried by a belt conveyor, about



THE NEW CONCENTRATING MILL AT BINGHAM, UTAH.

250 ft. in length, to the crushed-ore bin at the head of the mill. This conveyor carries the ore up an incline of about 24°. From the mill bin the ore passes to two sets of roughing rolls, which reduce it to 0.125-in size. It is then elevated to a series of screens, there being four sets of two screens each. The first section sizes to 8-mesh, the second to 30-mesh. The oversize from the first section is sent to two sets of middling rolls; the oversize from the second section passing to the Chilean mills, of which there are six. The 30-mesh undersize goes to Allis-Chalmers classifiers.

The Chilean mills, which reduce to 30-mesh, also re-grind the product from the middling rolls, and discharge their product into the hydraulic classifiers. The classifiers, which are separated into several compartments, discharge their differently sized materials to different groups of concentrating tables. The overflow from the classifiers goes to a series of V-shaped settling tanks.

On the concentrating floor are 32 Wilfley, two Card and two Overstrom tables, two Wilfley slimers and 18 Frue vanners. The tables take the material, as sized by the classifiers, and the product of the settling tanks is re-concentrated on the vanners and slimers.

The power is supplied by eight tubular, steam boilers, having an aggregate capacity of 600 h. p., all fired by automatic stokers. The crushing machinery is driven by a Corliss engine; a second engine operating the concentrating machinery. The building is heated by steam, distributed by Buffalo fans through coils of pipe.

The foundation under the Chilean mills contains 700 cu. yd. of concrete; it is 100 ft. in length, 18 ft. high, 18 ft. wide at base and 9 ft. at top. The main retaining wall is 240 ft. in length, 18 ft. high, 2 ft. wide at top, with a varying width of base.

The water for the mill is lifted from a 90-ft. shaft by a Cornish pump to a tank above the mill.

The capacity of the mill is calculated to reach about 500 tons per day, though it is just now starting to operate, and its capacity can be more accurately determined later on. The ore to be treated is largely a chalcopyrite, carried in a porphyry gangue, in the milling of which the slimes problem will be important.

The mill was planned by General Manager D. C. Jackling, assisted in designing by H. E. Nelson, and its operations will be under the superintendency of F. G. Janney. The accompanying photograph gives a general view of the plant.

GERMAN STEEL PRODUCTION.—The steel production of Germany for the year 1903 is estimated at 8,820,000 metric tons, showing an increase of 1,040,000 tons over 1902. This included steel of all kinds, but by far the larger quantity of that made in Germany is basic converter metal.

PIGMENT FROM WASTE ARC-LAMP CARBONS.—According to the French patent, 335,795, issued September 16, 1903, R. Peters utilizes the carbon fragments by heating them in crucibles to about 2,000° to 2,500° C., and while still hot, plunges them into an oil-bath, where they are left for 12 to 36 hours. By this treatment the carbon fragments are rendered very friable, and can be pulverized and mixed with adhesive material, etc., to form pigments, like Chinese ink.

CLEANING BITUMINOUS COAL.

In the preparation of coal for market there is plenty of room for that adaptation of means to end which is the aim of engineering education. A departure from rule-of-thumb methods and a close study of local conditions may bring high success. A good illustration of what can be done by intelligent discrimination is given by Lewis Stockett[1] in a description of a plant erected at Stockett, Mont., to prepare coal for market, this plant being an adaptation of an anthracite breaker for the work of cleaning a hard bituminous coal.

The coal is mined from a vein of the Kootenai group of the lower cretaceous measures having the following section:

No.		Feet.	Inches.
	Sandstone ledge	..	..
1.	Top coal	1	2
2.	Slate	0	5
3.	Top bench	1	6
4.	Bone	0	7
5.	Gray coal	1	3
6.	Blacksmith coal	2	5
7.	Bone	0	5
8.	Coking coal	1	5
	Metamorphosed fire clay	..	..
	Coal	7	9
	Refuse	1	6
	Total thickness	9	3

The vein is nearly horizontal in position, and each bench differs in quality, as shown by the accompanying table, the numbers in which corresponding to those in the above section; the figures are per cents.

	1	3	5	6	8
Moisture	4.35	2.85	3.05	2.65	3.01
Volatiles	30.90	28.95	25.10	35.85	29.55
Fixed Carbon	54.90	53.45	51.55	51.35	52.09
Ash	9.85	14.75	20.30	10.15	15.35
Sulphur	2.56	1.64	1.33	1.45	1.92
Specific Gravity	1.29	1.29	1.75	1.29	1.44

It will be seen that, while the percentage of fixed carbon is fairly uniform, the ash-content varies greatly.

There are no partings whatever between the different benches of coal, slate and bone, the seam being a hard, solid mass from top to bottom, and a liberal number of pyrite nodules, or sulphur balls, scattered promiscuously throughout the seam, makes the coal difficult to clean. Previous to the building of the breaker, the cleaning was done with indifferent results by the miner, at the face, and the nut-coal was washed in a jig. Scarcity of water, however, prevented the erection of a plant to wash the whole product, and at times necessitated the shutting down of the nut-coal washer.

The difficulties to be overcome in separating the different material of the vein may be seen from their specific gravities, which were: Sulphur balls, 4.140; slate, 2.402; bone, 1.963; gray coal, 1.5 to 1.751; coking coal, 1.440; other coal, 1.290.

After a series of experiments, a scheme of treatment supplementary to the cleaning by the miner was determined upon and carried out. The machinery started August 10, 1903, and has since been in continuous operation every week-day with gratifying results. The coal is dumped from the 1.5-ton mine cars by a cross-over tipple over a bar-screen with 2-in. spaces. The fine coal, about 30 per cent, goes to a shaking screen with 1-in. perforations that removes the slack, which is loaded on the railroad cars or goes to the boiler room. What coal passes over the shaking screen is elevated to the top of the building, and then passes over shaking screens having respectively

[1] 'A Bituminous Coal Breaker,' *Transactions* of the American Institute of Mining Engineers, February, 1904.

1, 1.5, 2, 2.5, and 3-in. round perforations, separating the coal into slack, pea, nut, stove, egg and broken sizes. The coal that passes over the bar-screen goes to a picking belt, and any large pieces of slate, sulphur balls or such objects as sprags, car couplings, etc., are removed by men and thrown into a rock elevator. The picking belt delivers the coal to rolls having removable teeth, where it is broken to not exceed a 4-in. cube. From the rolls the coal is elevated and goes to the shaking screens before mentioned.

The slack made in breaking the coal is clean, and goes direct to the mixed-coal bin. The other sizes are fed to spiral separators, which remove most of the impurities. Some hand picking by boys is necessary. The refuse is used by the railroad for widening banks, etc. The material that goes to the rock elevator is carried in a 6-ton car, hauled by tail rope, to the top of a neighboring hill, where it is automatically dumped.

On account of the slight difference in the specific gravity of the gray coal and the bone, the spirals are adjusted so as to retain only the slate and flat sulphur balls, leaving the bone to be removed by hand. The round sulphur balls, which, on account of their shape, are the first to leave the spirals and go with the coal, also have to be removed by hand. The percentages of refuse in the various sizes are: In pea coal, 4; in nut coal, 3; in stove coal, 3; in egg coal, 2; in broken coal, 1; and in mixed coal, 2.5 per cent. Out of 2,000 tons of run-of-mine daily dumped into the breaker, 200 tons of impurities are removed, and these impurities do not contain on an average over 1 per cent of coal.

The mixed coal is used by the railroads as a locomotive fuel, and proves an excellent article. The various sizes are used commercially, the slack and the pea size making excellent boiler fuel.

The cost of the breaker, in a section where the highest wages are paid, and where freight is a very large item, was $42,518, which includes 300,000 ft. of lumber and 400 yd. of masonry, as well as duplicate pieces for all parts of the machinery liable to break or wear out.

The cost of operation of the plant, including all charges over and above the force previously used on the old tipple, amounts to an additional cost per ton of 6c., the total labor cost per day being $44. The largest item of cost comes from the decreased production by removal of impurities; the total cost being now divided by 1,500 tons of lump-coal as compared with 1,700 tons formerly. This is met by the increased price received for the coal.

The author says that the success of this plant will make available large fields of coal in Montana which were hitherto regarded as unworkable. The spiral pickers, however, work successfully only with coal hard enough to keep its shape, and there is a marked difference in the specific gravity and shape of the coal and of the impurities,

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COAL PRODUCTION OF AUSTRIA-HUNGARY.—In 1902, the last year for which official statistics are available, the coal production of Austria was 11,045,039 metric tons, and of lignite 22,139,683 tons, a total of 33,184,722 tons, while in Hungary the production of coal was 1,098,926 tons, and of lignite 5,103,236 tons, a total of 6,202,162 tons.

USE OF RUBBLE CONCRETE FOR THIN WALLS.

Henry G. Hammon, in a communication published in the *Engineering News* of January 14, 1904, states that he has found the use of large stones in concrete to be a frequent cause of failure in otherwise good work. Large stones cause irregularity in shrinkage, and are a dangerous factor, even in walls 2 ft. thick. It is only in monolithic work, such as dams or foundations, which are thick rather than high, that their use can be considered harmless. The use of large stones increases porosity in the work, since tamping cannot be equal where they are employed. Moreover, the tensile strength of the work is reduced unless the stones are stronger than the cement, which is seldom the case.

The *Engineering News* does not consider that these objections are entirely well taken, stating that although, in laying thin walls with dry concrete surrounding rubble stones, it requires great care to prevent the formation of voids, on the other hand, where the concrete is so wet that the rubble stones almost sink into it by their own weight and are readily forced down by men jumping on them, there is no danger of porosity in the wall. Thin walls of rubble concrete have proved eminently satisfactory when properly laid.

A recent specification, drawn by the Reclamation Service of the United States Geological Survey, provides that in concrete walls more than 2 ft. thick, pieces of sound hard rock, not more than 12 in. or less than 6 in. in any dimension, may be placed by hand in soft concrete, if no stone comes nearer than 2 in. to the face of the wall or to any other stone so placed.

This is quite an important matter, since the use of large stones in concrete work reduces the cost very materially.

ELECTRIC HAULAGE FOR MINES.

At a meeting of the Yorkshire Branch of the National Association of Colliery Managers, Mr. Geo. Farmer read a paper on 'Electric Power Applied to Underground Haulage' from which these notes are taken. They are of interest as from a British viewpoint.

To ensure safety, the best materials and safest designs should be employed; faulty designs, careless installation and overloading must be avoided. For driving an underground haulage engine, the oldest practice is that of carrying steam down the shaft, to the engine. This system, though not liable to breakdown, is not economical where large powers have to be transmitted long distances. Compressed air, as widely used as any other system on account of its safety, is not very efficient unless stage compression is used, and the first cost and cost of attendance are very high. The best system, evidently, is that which lends itself to the cheapest distribution of the power developed in the boilers. There is little difference between electric power and compressed air, so far as generation goes, and the comparison is merely one of efficiency in transmission; but where a driving plant is centralized for electric transmission it can be placed close to boilers, and high-class engines installed without excessive cost. The total allowance for an unusual load need not be so great with a large centralized plant as with a number of small engines doing the same work, while the larger the engine and the greater its load, the lower is the cost per load per horse-power.

Regarding electric cables, where used in a position out of reach of persons or animals, they are commonly of bare copper wires. In the mine, however, insulated cables are necessary. These may have additional protection by being armored with galvanized iron wire or steel tape. It is advisable, if possible, to always carry the cable along the intake airways, as a return air often has a most injurious effect upon armoring. Such cables can be suspended by loops of leather on the side timbers, then, in case of a fall of roof, the loops give way easily and the cable falls to the ground, lessening the risk of its being broken or cut. The insulation resistance should not be less than 600 megohms for a current of 220 volts, and cables should be enclosed in wood casing, while permanent cables for damp places may be covered with lead or vulcanized rubber and run in wood boxes well tarred. With proper precautions, the risk from the transmission of the current along the roadways may be reduced to a minimum, and with pressures up to 500 volts the transmission should seldom, if ever, cause serious accidents.

ELECTRIC POWER IN JAPAN.—According to the London *Electrical Engineer*, there is great activity in the utilization of electricity in Japan, for lighting, power and traction purposes. The electric light works at Tokio have been in operation for a considerable time. The output at present is 5,000 h. p., but this is being increased by an additional 3,600 h. p. One city of Japan plans to develop 10,000 h. p. by using the power of the Tama river. Power stations will be erected at three points. Electric traction systems are being installed at various points, one of these, 20 miles in length, being now under construction. The plant for this road is in course of erection, and will have an output of 540 horse power.

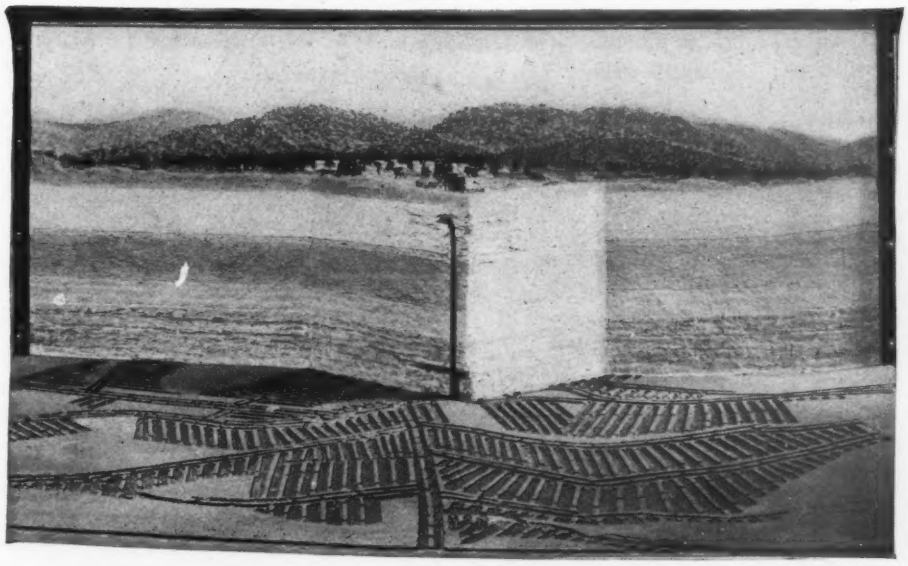
COAL IN SIBERIA.—According to a French Consular report, the coal supply of Siberia is adequate to the demands of the Trans-Siberian railway. The stretch of 3,000 km. from Tcheliabinsk to Irkoutsk is entirely supplied from Siberian mines, the estimated consumption in 1903 being 300,000 tons. Most of this coal comes from two regions, Shudschenka in the government of Tomsk, and Tscheremchow in the government of Irkoutsk. The former is a very fair coking coal, with only 7 to 11 per cent of ash; the latter is very friable, with over 20 per cent of ash. But mining at Shudschenka is difficult, owing to the thinness of the seams and the depth of the workings, while at Tscheremchow it is easy, and consequently the bulk of the output comes from the latter mines. Most of the coal at Shudschenka belongs to the Crown. On the railway from Tcheliabinsk to Petropawlovski, Ural coal is used, but is reported to be high in sulphur. As a result of the outbreak of hostilities, and the consequent difficulty of forwarding coal long distances over the line, mines may be opened at Koltschagin and other districts on the western section of the Trans-Siberian road, and connected with the main line by short branches.

SOME OF THE COAL EXHIBITS AT THE ST. LOUIS WORLD'S FAIR.

By Edward W. Parker.

The supremacy of the United States among the industrial nations of the world is, as is well known, due primarily to the abundance and cheapness of our supply of coal. Our production of coal in 1902 amounted to a little over 300,000,000 short tons, and the returns for 1903 indicate that the output last year was not far from 350,000,000 short tons. The value at the mines, of the coal production of 1902 was $367,000,000, exceeding by over $215,000,000 the combined output of gold and silver, making up 30 per cent of the total value of our entire mineral production. How dependent we are upon this product of our mines, was brought with telling force to the attention of every citizen, and particularly those of the eastern States, when the great anthracite strike of 1902 cut off that source of supply.

It is because of the great and growing importance of this industry, and of the direct and personal way in which it interests nearly every citizen of the country, that the Department of Mines and Metallurgy, at the Louisiana Purchase Exposition has determined to make coal and coal mining prominent features of that department. In outlining the plans for the preparation of these exhibits, two principal ends were aimed at. The first was to make them of high educational value, and at the same time of great interest to the general public; the second, to make the most complete representation of the coal mining industry that has ever been shown at an international exposition, or anywhere else. These efforts of the exposition authorities have been seconded by a number of the larger coal mining companies and associations of operators, by the United States Geological Survey, and by the commissions appointed by the governments of coal-producing States.



MODEL OF MINE NO. 18, JENNY LIND, ARK., WESTERN COAL & MINING CO.

At the request of Prof. J. A. Holmes, chief of the Department of Mines and Metallurgy, the writer, early in 1903, prepared plans for a collective coal exhibit, which would, it was hoped, illustrate the manner in which coal occurred in the earth, the different methods employed in mining, and as much else as it was possible to show, which would give the public an interesting lesson on this foundation of the Nation's industrial life.

THE ANTHRACITE EXHIBIT.

The plan for the exhibit of the anthracite coal industry which was prepared at that time was as follows:

1. Four relief maps, each occupying about 100 sq. ft., that is, one map of each of the four principal basins in the anthracite regions, the Northern, Eastern Middle, Western Middle, and Southern. These maps are to show, in addition to topography, the situation of the mines, towns, the transportation facilities, drainage, and surface geology; above each to be suspended a number of glass slides upon which would be indicated the structural geology in the different parts of the region.

2. Relief map on a smaller scale, say, about 5 by 6 ft., showing the geographical relations which the four different basins bear to each other. This map also to show the surface geology to some extent, the topography, drainage, and the position of the principal towns with their railroad connections.

3. Model of a typical anthracite mine, in which would be shown the different conditions of mining, that is to say, part of it to illustrate mining on a level, part on a moderate dip, and part where the seam is steeply inclined or actually overturned on itself. The idea was to show part of this model with the surface improvements, and then, say, two-thirds of it, as if the roof were taken off and the coal exposed, illustrating, by figures of men at work, the difficulties of mining under the conditions named above, and the methods of ventilation, haulage, and hoisting or pumping water.

4. A working model of a breaker which would actually break down and separate the coal and slate, and size the coal. This to cover a space of from 150 to 175 square feet.

5. Model of a washer recovering coal from a culm bank.

RELIEF MAP OF KANAWHA COAL REGION, WEST VIRGINIA.

6. Specimens of the different varieties and sizes of anthracite coal, with maps, statistical charts, photographs and other illustrative data to complete the attractiveness and educational value of the exhibit.

The credit for the successful carrying out of this plan, or the greater part of it, is due to Prof. Louis E. Reber, of the State College, Pa., who was requested to undertake the work by the Pennsylvania World's Fair Commission. Owing to the expense involved, it was not found practicable to have the relief maps constructed, but visitors to the fair will find in the Pennsylvania exhibit an illustrated lesson on anthracite mining. Through the co-operation of the anthracite companies, Prof. Reber has been able to secure the funds and data necessary for the preparation of an interesting and instructive exhibit. It will include a working model of a typical mine, a working model of a breaker, another of a washery, and some geological sections and other material which will afford as complete a representation of anthracite mining as could be made. The plans for the mine model were prepared for Mr. Reber by Mr. Arthur H. Storrs, of Scranton.

BITUMINOUS COAL EXHIBIT.

The plans for the illustration of the bituminous coal mining industry embodied somewhat similar features, differing as the nature of bituminous mining differs from that of anthracite. This plan also included relief maps of some of the principal bituminous coal mining regions, which had been topographically surveyed, and for which the data for showing the geological structure were available. It also embraced models of mines and mining camps, models of washing plants, coke ovens, and full sections of coal from most of the important seams, with maps illustrating the areas underlaid by them.

Three large geological relief maps, each about 60 sq. ft. in size, will be prepared. One of these, constructed for the Indian Territory Coal Operators' Association, will show the coal fields of the Indian Territory. The other two,

as seen by the accompanying photographs, will show the New River and the Kanawha districts in West Virginia, and are being constructed for the New River Coal Operators' Association, and the Kanawha Coal Operators' Association, respectively. These two districts are adjoining, but the relief maps exhibit interesting contrasts between them topographically, and the coal seams mined in the two districts belong to entirely different series. The New River map shows the river from which it is named, entering near the southeast corner, flowing about north-northwest and leaving the region just east of the northwest corner. The country penetrated has marked plateau features, through which the New river has cut deep, narrow canyons. The Kanawha map shows the New river entering it near the southeast corner, a small area of this corner of the Kanawha map and of the northwest corner of the New river map being identical. The Gauley river joins the New, just west of the eastern limit of the map, forming the Kanawha. It will be observed that the entire district west of this has none of the plateau characteristics of the adjoining areas drained by the New river, but is altogether ridges and valleys. The coal seams of the New river series go under water just east of Hawk's Nest, and those of the Kanawha go into the air several hundred feet up the mountains from that point, all of the strata dipping to the west. All of these relief maps will have suspended above them a number of geologic sections painted on glass, so that the structure of the regions may be easily studied.

The methods employed in the mining of bituminous coal will also be shown by a number of models, some of which will be in actual operation. The largest single exhibit will be that of the coal mining interests associated with the Baltimore & Ohio Railroad Company. This organization, in all of its departments, has contributed generously to the Exposition and will have some of the most interesting exhibits at the Fair, both in the mining and in the transportation departments. The coal mining exhibit has been prepared jointly by the Fairmont Coal Company, operating in Harrison and Marion counties, West Virgnia; the Consolidation Coal Company, operating in Allegany county, Maryland, and the Somerset Colliery Company, operating in Somerset county, Pennsylvania.

The Fairmont Coal Company's exhibit will be in three sections and will cover a floor space of 3,660 sq. ft. The principal section will be that representing a complete coal mining plant of the Fairmont Coal Company, showing the tipple, washer plant, crushers, elevators, conveyors, revolving screens, box-car loaders, bins, coke ovens, coke crusher and graded bins, larry, seven railroad tracks, 20 to 30 railroad cars, boiler house, electric power house, office, superintendent's house, several types of miners' houses, ventilating fan and house, roadways, walks, terraces, rocks, trees, embankments, electric pole lines and, in fact, everything required to make the plant complete, and to make the picture a natural one.

This model will occupy a floor space of 30 by 40 ft., and everything therein will be constructed upon a scale of one inch to the foot. This is a much larger scale than that usually adopted for such models, and will permit the carrying out of the work in fine detail. The highest point of the ground surface will stand about 7.5 ft. from the floor, and the whole will rest upon a base 24 in. high. Sections of the interior workings of the mine, with miners at work, will be shown, and numerous mine cars, drawn by electric locomotives, will make trips at regular intervals through the mine and over the tipple. The mechanical part of the exhibit will be especially interesting, as the models are all to be working and in actual operation, conveying the coal to the different parts of the plant as in actual practice.

Another section of the exhibit will be a model similar to that above described, and will be a composite, representing mines of the Consolidation Coal Company, and the Somerset Coal Company, the former at Frostburg, Md., and the latter at Somerset, Pa.

In the Consolidation model will be given on a large scale the interior workings in horizontal section, that is, with the ground above the mine workings removed, showing the interior of headings, air-courses, rooms, etc. There will also be shown in this mine a shaft, at the bottom of which will be seen large chambers walled with brick and containing the pumping machinery. An idea of the size of these pumps will be indicated by the models, which are 38 in. over all, representing 38 ft. in the pumps.

A modified representation of the inclined mine-car tracks and rope-haulage of the Pine Hill mine of the Somerset Company will be shown in another part of this model, together with the boiler house, electrical power house, tipple, railroad tracks, and other objects to complete the topographical and natural representation, reproducing the local coloring as far as possible. The model will occupy a floor space of 28 by 40 ft., and will be somewhat similar in general contour to the first described.

Upon the edges of both models, the coal seams and other strata will be shown in vertical section properly designated and colored. The principal part of the mechanical work, including structural work of the tipple, washer house, coke-crusher and bins, and all the chutes, screens, larry, mine-cars and electric locomotives, is under construction in the shops of Messrs. Wagner & Palmros. The work, though small in amount of material used, nevertheless demands a high degree of skill in workmanship.

The topographical work, or that representing the ground surface and scenery, houses, tracks, coke ovens, mine openings and interior workings is under construction at the works of the Decorators' Supply Company, of Chicago. This part of the model will be no less interesting than the mechanical part, and is considerably more comprehensive and expensive. Both models must be made in 20 sections each, to provide for packing and shipment, and are to be set up in the Mines and Metallurgy Building on or before April 30. The space allotted in this building, 62 by 59 ft., comprises one of the two central blocks and is at the intersection of the main aisles and adjacent to the exhibit of the Bethlehem Steel Company.

The third section, or general division of the installation, will consist of a pavilion built almost entirely of coal and coke. The floor space occupied by this pavilion is 32 by 12 ft., and the height about 16 ft. The design is classic, there being eight columns with pedestals supporting a series of arches with cornice and balustrade. The weight of the superstructure is borne by steel skeleton frame-work. The column shafts are faced by glass cylinders 12 in. in diameter, and the spaces inside of these cylinders, not occupied by the steel supporting posts, are filled with the different grades of crushed coal and coke, providing an excellent means of showing these mine products to advantage.

The Exposition departments of the Consolidation and the Somerset companies, as well as that of the Fairmont Company, are under the direction of General Manager L. L. Malone and General Superintendent J. C. Gaskill. W. S. Mayers has been appointed engineer in charge of the construction, and has immediate supervision of the numerous details.

The working drawings of the Fairmont model, which involved no small amount of labor, were under the charge of J. C. Gaskill, general superintendent, and executed by Messrs. Fred C. Helmick, of the Helmick Foundry & Machine Company, and W. S. Mayers, and those of the other model were prepared under the direction of Messrs. B. F. Randolph and J. C. Brydon, superintendents respectively of the Consolidation and the Somerset companies.

Another feature of the exhibit will be numerous large photographs or transparencies, showing the principal plants of the three companies, also the lake and bay steamers and large loading docks at Curtis Bay, Baltimore; Lorain, O., and Duluth,.

Large sections of coal, the full height of the various seams, will be mined and set up near the models, and numerous show-cases will exhibit to good advantage the various products of the mines.

Not the least important feature will be the literature, consisting of pamphlets, both technical and descriptive, souvenir art folders, maps, etc. These will be prepared under the direction of Mr. Frank Haas, the geologist.

The exhibit of the Pittsburg Coal Company, of Pittsburg, the largest single coal-mining organization in this or any other country, will be one of the most interesting and complete in the Palace of Mines. It will be prominently placed near the center of the building, and immediately adjacent to the exhibits of the Somerset Coal Company, the grouping of the exhibits being as near as possible according to geographical positions. It will be the representative of the great coal-mining industry of the Pittsburg district, and will play an important part in the educational scheme. It has been designed and constructed with the idea of being especially interesting to the general public.

The principal feature will be a complete model of a modern coal mine. First Pool mine No. 2, on the Monongahela river, was selected for reproduction, it being one of the best equipped mines of the Pittsburg district. The model shows, first, the surface with the railroad, the new modern steel tipple, the blacksmith shop, the fan house, and air shaft, all faithfully reproduced. Back of the tipple, on the hillside, are shown the church, schoolhouse, store, and miners' houses. On the other side of the railroad track from these is the railroad station, and under and around the tipple are railroad cars loaded and in process of loading.

Beneath the surface, ingeniously lighted, is the mine, showing the main and butt entries, brattices, stopings, sump, rope haulage, air locomotive, etc., all reproduced as nearly like the original as it is possible to make them. Methods of mining will be shown by moving figures of men at work with picks and with different kinds of mining machines, the machines running as if actually undercutting the coal, while loaded pit cars will be seen going in the direction of the shaft, with the empties returning.

Another feature of this exhibit will be a working model of a modern coal-unloading machine, such as are in use at the Lake ports for transferring coal direct from cars to vessels. This model will show the loaded cars going into the machine, the method of turning them over, and the coal dumped from the cars and run into a vessel alongside the dock.

In addition to the features above described, there will be a number of rectangular pillars of coal giving full sections taken from some of the more important mines belonging to the company. Specimens of coal from several different mines as prepared for market will also be shown. The exhibit will be rounded off by maps, photographs, charts, etc. The Pittsburg Coal Company produces over 12 per cent of the total output of bituminous coal in Pennsylvania, and more than that of any other State except Illinois, Ohio, and West Virginia.

The first portion of this collective exhibit to be put on the space reserved for it is a model of the Jenny Lind mine No. 18, of the Western Coal & Mining Company, of St. Louis. This mine is near Jenny Lind, Arkansas. A photograph of the model is given on page 559, the foreground showing the mine with the overlying strata removed. This is not a working model, being on too small a scale to operate as such, but it shows almost the entire workings, made up accurately from the mine maps. Practically, all the important details of the mine are given. The air-courses are indicated by arrows in the model, break-throughs, cross-overs, etc., being accurately placed. In the rear are shown the shaft and shaft-house, tipple, and railroad, with the mining town lying between them and the mountains. The geological section, drawn to scale, is exposed between the surface and the mine. The model is 6 ft. square and is constructed on a scale of 1 in. to 30 ft. This, and the relief maps previously mentioned, were made by Edwin E. Howell, of Washington.

RELIEF MAP, NEW RIVER COAL-FIELD, WEST VIRGINIA.

A model of a washery for the improvement of the coal used in making coke will be exhibited by the St. Bernard Mining Company, of Earlington, Kentucky, and this company will also exhibit two large sections of coal, one each from two different mines. Another exhibit from Kentucky will be a model of the largest mine in the State, operated by the Reinecke Coal Company, of Madisonville. This model will occupy a space of about 500 square feet.

Prominently placed among the coal exhibits will be a column built of cubes of coal illustrating graphically the total amount of coal produced in the United States from the earliest times to the close of 1903. Each of the cubes will represent the production for a period of 10 years. They will be constructed on a scale of 1 to 1,000, the bottom cube of 4.475 ft. on each edge representing a mass 0.85 mile high, on a square base of the same dimensions. The column will be built of coal furnished by the Kanawha Coal Operators' Association of West Virginia, and will be 18 ft. (representing 18,000 ft.) high.

Still another feature promised from West Virginia is an immense column over 100 ft. high, showing, in their order, the 21 seams worked commercially in the State. Each section of the column will be built of coal taken from the seam represented, and each seam will be shown in its average thickness. It will have a prominent place in the grounds outside, as it will be too high to be put inside the Mines Building. Much of the credit for the thorough manner in which the coal resources of West Virginia will be displayed is due to Mr. Neil Robinson, of Charleston, whose efforts have been cordially seconded by the operators and the railroads interested in the development of the State.

In the present article an attempt has been made to describe only the exhibits which will be placed in the collective and educational display, and with which the writer has been somewhat identified. In addition to these, there will be, within the spaces reserved for the several States, many interesting and attractive displays of the coal-mining industry. These will be described in a later article. It may be stated, however, that there will be the largest and most complete collection of coal sections ever shown at any exposition, and time spent in a careful study of the entire display will not be without benefit to those interested in one of the principal sources of our wealth and progress.

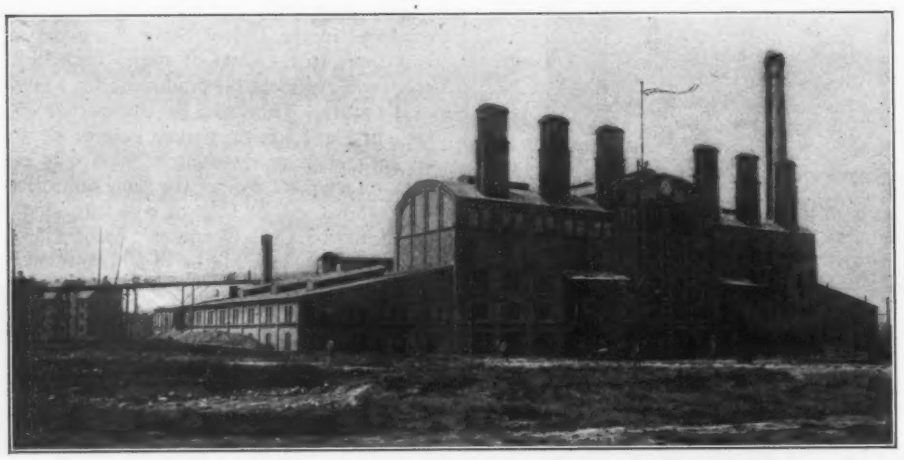
EASTERN OUTLET FOR THE WABASH RAILROAD SYSTEM.—The tracks of the Western Maryland railroad are being laid in Baltimore from Walbrook station to Spring Garden, and a bridge is to carry the tracks across the arm of the Patapsco river to tracks running to Winans wharf. Work has continued through the winter on the extension from Cherry Run to Cumberland, this 65-mile piece of track calling for numerous tunnels, and five bridges across the Potomac. It is stated that work on the extension from the Pittsburg, Carnegie & Western, at Bishop, through Greene county, and through West Virginia to connect with the West Virginia Central & Pittsburg, will begin as soon as the weather is settled. The completion of these two stretches of track will give the Wabash a through route to tidewater, and is likely to affect, among other things, the bituminous coal trade situation on the Atlantic seaboard.

RECENT ADVANCES IN THE UTILIZATION OF PEAT AND LIGNITE.*

By H. H. Wotherspoon, Jr.

The fuel question is one that is causing a great deal of serious thought. Wood is out of the question for fuel purposes, excepting in few and remote localities. Coal has increased, during the past few years, more than 40 per cent in its cost to the consumer. During the next twenty-five years it is quite evident that efforts must be made to utilize other forms of carbon that exist in nature. The Europeans have been obliged to meet this proposition, and the resources of their engineers and scientists have been taxed to produce efficient and cheap substitute fuels. For more than forty years, peat fuel has been recognized as one of the necessaries of life, and its excellent qualities are widely advertised. Brown-coal or lignite is in general use at the present time. All the continental European cities consume large quantities of this fuel, and in many localities in central Germany the use of brown-coal briquettes is not confined alone to the household; the breweries in Bavaria and other industrial works use large quantities. The principal deposits of lignite from which these briquettes are made exist in two different parts of Germany. The larger, known as the Lausitz district, is situated to the south and east of Berlin and covers a large territory. The smaller area is on the west bank of the Rhine, in the neighborhood of Cologne, and is very rich in fuel-values. These two localities include over 280 factories for the manufacture of this briquetted fuel, having a total of 680 presses. The output for 1902, according to the briquette syndicate, was, approximately, 12,438,000 metric tons. Most of this fuel was consumed in the larger cities of Europe.

Among the factories producing the greatest amount of briquettes are the A. Riebeckshe Montanwerke Company, near Halle, which controls 15 plants, and operates 50 presses in the daily production of 3,000 metric tons of briquettes; and the Eintract Company, with six plants, which operates 31 presses and produces 1,860 metric tons daily of the Anker briquettes. The latter briquette has the largest sale in the city of Berlin; over 120,000 tons having been consumed there during 1902. The Ilse Bergbau Company has four plants in operation, and produces 1,620 metric tons of the Ilse briquettes, well known throughout central Europe. These plants are very substantial, the buildings being of brick; and the installation in most cases is very costly. These briquettes are well advertised and are greatly in demand. In dimensions they are 7 in. long, 2.5 in. wide and 1.5 in. in depth, with corners rounded. The process of converting brown-coal into briquette form consists in developing the latent bituminous matter within the lignite by the aid of heat, and then compressing the same in powerful tube-presses which have a capacity of 60 tons per 24 hours.



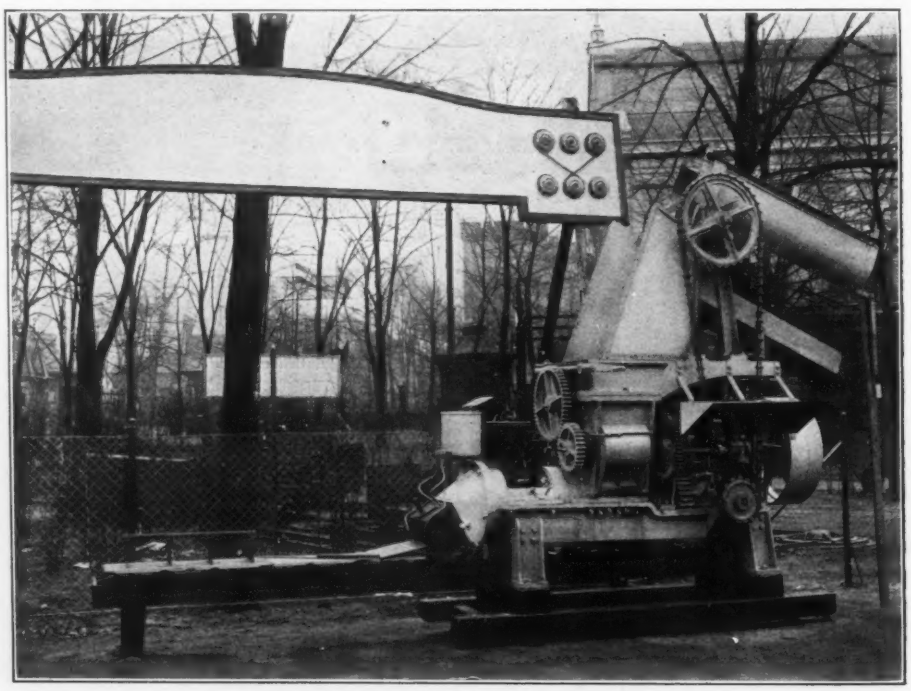
BROWN-COAL BRIQUETTE FACTORY AT DREBKAU, BRANDENBURG.
Owned by the Volldampf Mine. Capacity 650 Tons per day.

The wholesale selling price of these briquettes in the larger German cities is between $2.10 and $2.25 per metric ton. The brown-coal of Alabama has been briquetted by this process quite successfully, and has been declared by the German experts to be superior to the best product from their own mines. Attempts have been made to briquette the lignites of North Dakota, but with indifferent success; the briquette when finished is rather brittle. The calorific value of these briquettes is between 7,500 and 9,000 B. T. U., depending upon the quality of the raw material.

The advance of the Germans in the manufacture of bog matter into fuel is quite remarkable. The secret of their success in bringing about the rapid loss of water is due to the mechanical processes through which the material is put on leaving the bog. The machinery, which rapidly and thoroughly breaks up the cellular structure of the partly decomposed vegetable matter, sets free the water from the plant fiber and develops the peculiar vegetable mucilage or natural binding matter contained in the mass. After the peat has been thoroughly pulped, it is passed into compression tubes. Part of the moisture contents is here squeezed out of the mass and the remainder evaporates rapidly on exposure to the air, making a dense, clean, elastic fuel after about two weeks' time.

These fuel bricks are clean to handle and practically smokeless, and they have a calorific value of between 8,500 and 10,000 B. T. U. The ash from these briquettes is a fine, gray powder, free from clinkers and particles of unconsumed fuel. These briquettes, when burned, at first give off a long yellow flame due to the consumption of the volatile carbon, and after several minutes of this stage of the combustion, the briquette is converted into coke form. The absence of sulphur and the free character of the ash make this fuel very desirable under boilers.

American bog matter has been converted by this process into very good fuel and tests made by several authorities give a high calorific value. Prof. Norton's figures for the thermal value of American bogs range between 9,000 and 14,000 B. T. U. per pound, when bone-dry. The utilization of bog matter and brown coals in this country according to the successful commercial methods of the Germans, will do much to solve our fuel problem for the future. At the present time, certain localities remote from coal centres would do well to study the success of the Europeans in the manufacture and utilization of these lower forms of carbon.



PEAT FUEL MACHINE IN USE IN GERMANY.
Capacity 7,000 briquettes, or 4.5 tons per hour.

*Abstract of paper read before the New York Academy of Sciences at the meeting of March 21, 1904.

The greatest depth attained in boring for salt is 4,650 ft., at Salzdetfurt, in Hanover, Germany.

THE UTILIZATION OF ANTHRACITE CULM FOR PRODUCER GAS.

In a paper read before the Scranton Engineers' Club, J. Gardner Sanderson states that the results of tests and the continued experience at many gas power plants utilizing anthracite coal, both in Europe and in this country, showed ten years ago, on the average, a consumption of one pound of fuel per h. p., per hour. No very large single cylinder engines were then in use, power being increased by multiplying the number of cylinders or the number of engines. This made large gas-engine plants more expensive than steam-engines of the same capacity. The gas-generating plant, however, cost only about one-fifth as much as a first-class boiler plant of the same capacity. In operating expenses, aside from saving in fuel, there was a saving in water, labor, depreciation and repairs, in the gas-generating plant as compared with the steam-generating plant.

The same process was employed in Europe and America for generating gas with anthracite coal or coke, for power purposes. Producers of different construction were used, resulting in slightly variable efficiencies.

Mr. Sanderson presented analyses of gas from various anthracite coals and different producers. Gas from Welsh anthracite, nut size, in a Dowson producer showed:

	Per Cent.
Hydrogen	18.73
Marsh gas	0.62
Carbonic oxide	25.07
Carbonic acid	6.57
Nitrogen	48.98

Having about 160 British thermal units per cu. ft.

Gas from Pennsylvania anthracite buckwheat size, in a Taylor producer, gave on analysis:

	Per Cent.
Hydrogen	4.51
Marsh gas	1.79
Carbonic oxide	25.38
Carbonic acid	4.02
Nitrogen	64.04

Having about 120 British thermal units per cu. ft.

Gas from anthracite culm (buckwheat size and above being screened out) in a Sanderson producer, showed this composition:

	Per Cent.
Hydrogen	19.85
Marsh gas	0.66
Carbonic oxide	28.80
Carbonic acid	3.80
Nitrogen	46.49

Having about 165 British thermal units per cu. ft.

Since 1896, great progress has been made in the development of gas-power, especially in Europe; where there are large single cylinder engines utilizing blast furnace gas. Some of these engines are now being built up to 5,000 h. p. Mr. Sanderson gave estimates for a 100,000 h. p. gas-power plant to utilize anthracite culm for fuel, also for a steam-power plant of the same capacity and operated under the same conditions. He presented costs of gas-generating and gas-engine plants, and of operating expenses, also the costs of steam-generating and steam-engine plants and the cost of operating the same. The cost of a gas-power plant of the capacity named, 100,000 h. p., he estimated, would be about $4,000,000, and for a steam-power plant about $5,000,000, exclusive of buildings in each case.

The cost of operating the first, including culm at 25c. per ton, water, oil, attendance, repairs, depreciation and interest, is estimated at $716,250, for 365 days of 24 hours, or a gas-power cost of $7.16 per h. p. per year.

The cost of operating the steam-plant under the same conditions, based upon results of tests made by a committee of the Scranton Engineers' Club, is estimated at $2,221,575 per year, or a steam-power cost of $22.22 per h. p. per year.

BINDERS FOR COAL BRIQUETTES.

By Robert Schorr.*

Germany leads the world in the manufacture of fuel briquettes, chiefly by reason of the utilization of some large beds of lignite, and in 1903 produced over 10,400,000 metric tons. Very little has been done in fuel briquetting in the United States, chiefly from three causes; the cheapness of good mine-run coal, the high price and limited supply of suitable material for binders, and the discovery of fuel oil in places where fuel was expensive. The largest fuel briquetting works in this country to-day are those of the San Francisco & San Joaquin Coal Company, at Stockholm, Cal., where are two presses, each capable of turning out 180 to 220 tons of ball-shaped briquettes every 24 hours. Soft asphaltum-pitch and evaporated oil are used as binder, and lignite, with a certain percentage of bituminous coal, as raw material. Two or three other plants are in operation in the United States, and a considerable number of coal and lignite briquetting plants have been built, but most of them were unsuccessful, owing to lack of study and vague experimenting on lines which were abandoned long ago abroad.

The grains of the fuel should not be larger than 0.25 in., or less than 3-32 in. to make a good burning briquette. If the coal is ground too fine, the briquette will not ignite readily and will require a stronger draft. The ash content should not exceed 6 per cent; if it is higher, the coal should be washed. While any dry material can be bricked without the aid of a binder, the high pressure and large amount of power usually necessary make financial success impossible. It does not pay to briquette fat bituminous coals which do not need a binder. There is no difficulty in briquetting anthracite culm with the addition of pitch alone, but in some localities the addition of a little bituminous coal or lignite will be found advisable, as this will impart coking properties which are essential.

A desirable binder should increase the burning and calorific qualities of the raw material, should be free from ash and should make a solid and water-proof briquette. For these reasons organic substances are preferable to inorganic. Coal-tar, obtained chiefly as a by-product in gas and coke making, and the products of its distillation—various grades of pitch—are mostly used for binding. Coking and gas coals contain 3 to 6 per cent of tar, and in distilling the tar about 66 per cent of hard pitch is obtained. In European practice hard pitch leads, and when of good quality, it should contain from 75 to 80 per cent carbon and only from 0.25 to 0.5 per cent ash, a composition which corresponds with about 8,000 calories in heating value. The addition of from 5 to 10 per cent of pitch as a binder improves the value of fuel from 2 to 4 per cent, depending on the number of heat-units possessed by the raw material. Tar and soft pitch have many disadvantages, as they contain carbo-hydrates that cause smoke and smell; also the briquettes have to be kept cool, otherwise they will soften and stick, so as to form big lumps in the bins.

The distillative point of soft pitch is about 400° F., while that of hard pitch approximates 800° F. The specific gravity of hard pitch lies between 1.2 and 1.3; it is brittle, and for use as a binder it is usually ground fine, and mixed cold with the coal-slack. The mixture passes through a drier, and thence to the press. In some Belgian plants hard pitch, and from 1 to 1.5 per cent of tar are used, but briquettes of this kind burn with smoke and odor. As the price of hard pitch is rather high ($5.79 to $7.72 in France, $9.25 in Germany and $7.68 to $9.60 in England) the cost of a binder is the most serious item in making briquettes, and a cheaper substitute was sought for years, but no other organic or inorganic substance has attained more than local importance.

Other organic substances tried or used include starch paste (starch heated with water, to which a weak solution of sulphuric acid may be added); spoiled rye flour, potatoes, etc., contain starch and can be utilized. Briquettes using flour paste need heating to harden them, unless soft pitch is added. Vegetable and animal albumen are little used. Seaweeds in a state of decomposition, and cellulose make briquettes which are hard; they absorb moisture too readily, but the addition of 2 per cent of pitch or water-glass prevents this. Beet sugar molasses, where cheap, as in Germany and Austria, is of importance. It makes good briquettes, which, however, are very hydroscopic; hence a little linseed oil is added. From 1 to 1.5 of molasses dissolved in hot water is sufficient. The briquettes have to be dried to become hard enough for handling. Other organic binders, such as gum arabic, resin, glues, oils and natural asphalt, are of little importance.

In tropical countries, inorganic binders may be preferable, but elsewhere the organic are preferable, if they can be had in sufficient quantity and at reasonable cost. Clay, alum, sal ammoniac, milk of lime, gypsum, copper sulphate, etc., are of less importance than water-glass. Coal-fines with from 0.75 to 1 per cent of water-glass make good briquettes, which require from 5 to 8 days of drying before they become solid. The mixture of the sodium and the potassium water-glass, called double water-glass, may also be used.

The most important inorganic binder is the magnesia cement used as a paste and binder for making artificial stone. The use of 5 per cent of it will result in a stronger briquette than that made by any other binder. The quantity of ash so added amounts to but 2.5 per cent. The process of using magnesia cement is cheap, so no drying is required, and the only fuel consumed is that for power. The briquettes harden gradually at the ordinary temperature, and after 6 to 10 hours are strong enough to be stored or handled. In a few days they are capable of standing a pressure of from 7,000 to 22,000 lb. per square inch.

A good magnesia cement consists of 30 parts of 45 per cent magnesium chloride, 30 parts of 93 per cent magnesium oxide and 60 parts of water. The coal should not exceed 0.25 in., and should be mixed cold with the dry magnesia, then the magnesium chloride should be dissolved in water and thoroughly incorporated. The whole mixture should be pressed as dry as possible, and a pressure of from 2,000 to 3,700 lb. per sq. in. is advisable. Wherever good hard-pitch briquettes are in the market, it will be difficult for magnesia cement briquettes to compete on account of their higher ash-content.

*Abstract from a paper on 'Fuel and Mineral Briquetting' read before the American Institute of Mining Engineers, February, 1904.

A MISSOURI COAL-FIELD.

By Wm. Griffith.

The bituminous coal-field described in these notes lies near the St. Louis, Kansas City & Colorado railroad, a line now under construction from St. Louis to Kansas City, which passes through Versailles in Morgan county, Missouri. The coal-field is situated on the watershed of Indian creek, this covering an area of about 6 miles square, 10 miles southeast of Versailles. It is, by the new railroad, about 150 miles from St. Louis and 130 miles from Kansas City.

STOVER MINE, MISSOURI.

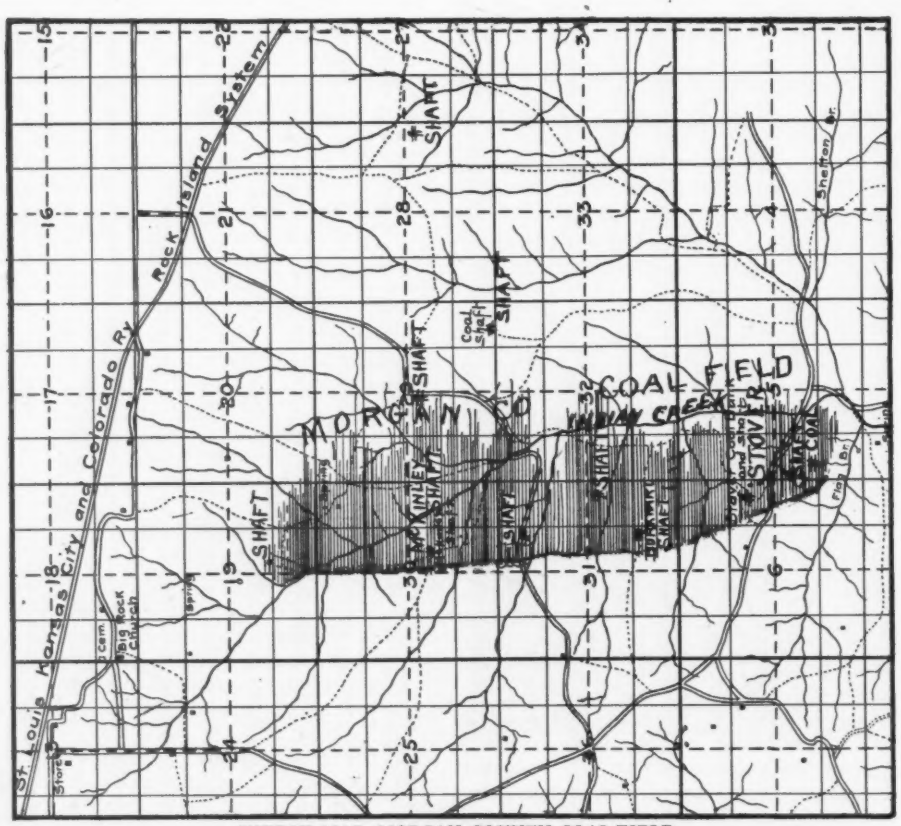
The roof, floor and side-walls are of solid coal.

ENTRANCE TO STOVER MINES.

Showing top of the bed in bank above entrance. Floor is coal.

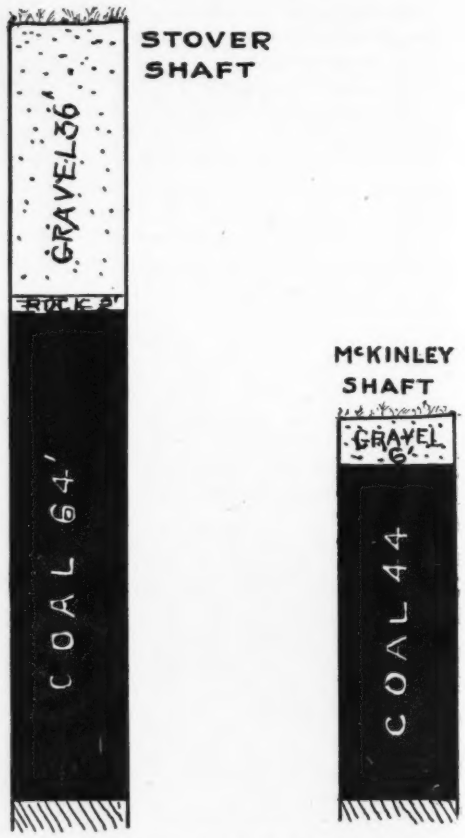
The principal opening in this field, the Stover bank, is in section 6, T. 41, R. 16. The field has been known to the people in the vicinity for many years, and has been prospected in a desultory way over an area of several square miles; but only at one locality, for a distance of about two miles, has there been done work which may be considered as satisfactory proof. Most of the old shafts have either caved or are filled with water, and the hearsay reports to be had now are rather unreliable. Along the western edge of the field a number of openings have been made, one of these being the Stover mine. Here a mammoth seam is exposed.

From an open-cut 20 ft. deep or so, a tunnel or drift has been driven westward into the coal. About 500 ft. north, a shaft has been sunk through 38 ft. of surface and 64 ft. of coal. The seam is apparently composed wholly of clean coal. Within the mine the excavation is about 100 ft. square, the roof being supported by pillars of coal and props. The greatest space from roof to floor is 15 ft. to 18 ft., and the whole excavation, roof, sides and floor is within the seam. This is shown by the accompanying cut. No continuous or persistent seams of rock, slate or other refuse are visible. At one point there is a band of slate about 6 in. wide and several feet long, but this is not persistent. Throughout the mine, the loose crevices in the vein seem to have been filled with zinc-blende deposited from filtrating waters. Zinc-blende has been found at other points in this coal-field, in the refuse material from the mouths of test shafts, and is also found in the soil overlying the coal.



SKETCH MAP, MORGAN COUNTY COAL-FIELD.

In the mine the coal dips rather sharply to the southwest, flattening slightly down the dip. In the shaft to the north the dip is flatter, but variable, being nothing on the top of the coal and perhaps 10° at the bottom. Northward from the Stover mine are numerous test openings, including what is known as the Widow Burkhard shaft in the S. E. ¼ of the S. E. ¼ of section 31; the McKinley opening in the N. E. ¼ of the S. E. ¼ of section 30 and others. Wherever the coal is visible in these openings it dips to the eastward. The McKinley shaft, one mile north of the Stover, shows 44 ft. of clean coal overlaid by 6 ft. of earth. The sections at the Stover and McKinley openings are shown by the diagrams. There are very few natural outcrops, but, judging from the openings and the general trend of the surface, the westerly outcrop of this coal will be found on a north and south line, running about 1,000 ft. west of the center line of sections 18, 19, 30, 31, 6 and 7.



SECTIONS OF SHAFTS.

Drilling and other work now in progress will throw further light on this unique coal-field. Until more work is done it will be impossible to make any positive statements as to the extent of the field; but, judging from what information is available, developments will probably show one or more long troughs or narrow basins containing bituminous coal seams of great thickness, covered by varying thickness of earth, or occasionally of shelly rock. The most economical mining method

undoubtedly will be to remove the surface and quarry the coal.

The quality of the coal is shown by the following analyses. The first three were made by A. S. McCreath, of Harrisburg, from samples collected by the author and the others are from various sources.

	Moisture.	Volatile Matter.	Fixed Carbon.	Sulphur.	Ash.
1.	5.414	41.976	42.092	4.603	5.815
2.	6.090	39.565	41.452	5.218	7.675
3.	2.288	42.672	45.395	4.31	5.335
4.	2.03	35.73	49.35	...	12.90
5.	1.60	36.40	53.90	...	8.10
6.	4.60	41.09	45.21	3.80	5.30
7.	2.10	45.60	45.20	...	9.20

Tested in a crucible, the coal yields a fair coke of rather high sulphur content. Analysis showed:

Fixed Carbon	84.920
Sulphur	4.006
Ash	11.074
Total	100.000

Judged by its percentage of volatile hydrocarbons this coal is primarily a gas coal, but it is too high in sulphur for the manufacture of gas. For steam purposes, it compares favorably with, and perhaps excels, most of the other coals with which it is likely to compete. Herein lies its particular value, since the field is so situated that the coal can be delivered at low cost to convenient markets, in competition with inferior coals. It is firm and hard, and will doubtless stand transportation to distant points without excessive loss from crumbling.

AN IOWA LITHOGRAPHIC STONE.

Lithographic stone is in good demand. The world's supply comes mainly from Solenhofen, Bavaria, and while lithographic stone has been often reported at various points in the United States, there is as yet no domestic production. The annual imports amount to about $100,000. Under the circumstances the discovery of stone in Iowa, which has been thoroughly tested and proved to be of good quality, is of considerable interest. The beds in question belong to the Devonian, and were discovered by the Iowa Geological Survey. They are discussed in considerable detail by State Geologist Calvin in his report on Mitchell county,[1] and in a special report by Mr. A. B. Hoen.[2] Mr. Hoen, whose wide experience in lithography gives great weight to his opinion, subjected the stone to careful chemical and physical tests to discover its composition, texture and absorptive power. He concluded that the Mitchell county stone is at least as good in quality as the Bavarian stone for lithography in all its branches, and it remains to be determined whether or not it can be had in such sizes and at such cost as would warrant its entering the market in competition with the foreign product. Mr. Hoen's report is illustrated by a plate engraved on this stone.

Since this report was published more stone has been quarried, and the Iowa Publishing Company, of Davenport, is now using Iowa stone. They are using it in the preparation of maps for exhibition at St. Louis next summer, where samples of the stone, as well as the maps, will be shown. At present the conditions seem exceedingly good for the development of an important local industry.

By 'paragenesis' is meant the association of various ores and gangue minerals, with special reference to the order and mode of their formation.

[1]Iowa Geological Survey, Vol. XIII., pp. 293-338.
[2]Pages 339-352.

COAL AND PETROLEUM IN CENTRAL ASIA.*

By E. D. Levat.

The existence of coal in Turkestan has been known for a long time. Soon after 1860, the Russian government began sending scientific expeditions into the country, and the reports subsequently published make frequent mention of the presence of coal in the bordering mountain ranges of Fergana, the Pamirs, and the Thian-shan. It is known, also, that the Chinese have exploited coal deposits in the vicinity of Kuldja since time immemorial, although their operations have been frequently suspended, owing to the incursions of Mongols. The so-called volcanoes of the Thian-shan mentioned by Humboldt were nothing else than smoldering bits of lignite.

The geological formations of Central Asia have all received, through their isolation from the sea, a single dominant characteristic peculiar to strata that have been laid down in a closed basin. The present remnants of lakes in the Aral-Caspian depression, the Aral sea, Lake Balkash, and other bodies of fresh or brackish water, are in process of being filled up by the debris which the rivers wash down from the high lands. Throughout the whole depression the fresh water or lacustrine facies predominate. The valleys of Fergana and Kuldja are ancient lake beds, and in the western ranges of the Thian-shan the lacustrine plains are particularly numerous. One of the most remarkable of these plains is the valley of Kashgar, through which flows the river of the same name, the principal source of the Chou. The northern slopes of the Thian-shan are everywhere much more gradual than the southern; they also receive a heavier rainfall, and are generally clad with magnificent forests of pines.

Of the stratified formations of Russian Turkestan, the Cretaceous presents by far the greatest development, and is of unusual interest lithologically, and from the fact that it contains the largest deposits of coal. The Cretaceous strata begin to appear near Kasalinsk, on the eastern shore of the Aral sea. North of that city, marls and sandstones are found, while to the east there are irregular beds of ferruginous and phosphatic sandstones. Still further to the southeast the Cretaceous disappears, only to crop out again beyond the Kara-tau chain, in the valley of the Syr-Darya, and in the Kizil-kum. In the mountainous parts of Turkestan these strata attain very strong development, notably in the valleys of the Zarafshan, the Fan-Darya and the Pasruth. From the general geological features of the country it is easy to draw conclusions as to the distribution of the coal deposits. Evidently the most favorable conditions are to be found on the borders of the ancient lakes, that is along the mountainous promontories that reach out into the steppes and divide the depression into large gulfs. These littoral zones have been more or less disturbed by dynamic agencies, and as they also show the effects of erosion, the underlying strata have been brought to the surface, thus tending to uncover the coal-seams. In general, therefore, the outcrops of coal are found at the base of the mountains, and not in the interior of the plains, and, as the railways have been laid down in the more level districts, it follows that the deposits are situated some distance from existing railroad lines.

A broad study of the orographic features exhibited in the bordering regions of the steppes shows that four great folds with N. W.-S. E. axes cross the plain between Tashkent and the Irtish river. The first fold is the Kara-tau chain, which is dissected by the valley of the Arys, and north of which lies the plain watered by the Chou. The railroad from Orenburg to Tashkent passes around to the south of the chain. In the basin of the Chou there are many coal-fields, the most important being situated near the sources of the Bouguni and the Arys, on the divide between the Chou and the Syr-Darya. Application has already been made for a mining concession in this field.

Between the Chou and the Valley of Vierny and Kuldja lies the Kondi-Tash range, which extends northward to Lake Balkash. Mention has already been made of the coal mines near Kuldja worked by the Chinese, and there are many seams on the left bank of the Illi, near Vierny, although none have been exploited in a regular manner.

Beyond Vierny and across the Illi river are the mountains of Kondi-Tash. The proposed railroad line to connect the trans-Caspian and Siberian railroads skirts these mountains on the west, but it will pass at some distance from the coal-beds. Still further northward is the coal-field near Sergiopol, which is the scene of considerable mining activity. The coal is transported down the Irtish, and is used on the Siberian railroad.

As many of the coal-beds above mentioned are far removed from means of transportation, and consequently will not be exploited for a long time to come, I will limit my description to those deposits occurring in the vicinity of railways now in service or under construction. Of the deposits thus situated, there are two in Fergana and two on the Turkestan-Siberian railroad.

Outch-Kourgan is situated 32 versts or 21 miles above Margellan, on the right bank of the Isfaran-sai, and is the terminal of the projected railroad to connect with the Andijan-Tcherniaievo line at Magellan. I found the coal-seams outcropping on both sides of a ravine that opens into the Isfaran-sai. The enclosing strata are thick beds of reddish gypsum, dipping 80° S. The total thickness of commercially valuable coal is about 10 meters. The coal becomes harder with depth, but, unfortunately, the deposit has been opened by slopes, so that the workings have to be kept dry by pumping, although they are 100 m. above the level of the Isfaran-sai. This difficulty could easily have been avoided by working the bed through drifts.

The coal of Outch-Kourgan has the character of lignite rather than of true coal. It burns with a flame, leaving a white ash, and some of it can be coked. Analyses of different seams show that the total fixed carbon ranges from 28.20 to 51.05 per cent, water and volatile matter from 42.80 to 64.40 per cent, and ash from 0.80 to 18.40 per cent.

Near Markai, northeast of Andijan, occurs a bed of lustrous hard coal which burns well and yields a tough coke. The seam is 2.1 m. thick. Between this locality and Outch-Kourgan there is a mine that is worked on a small scale, the product being marketed at Margellan.

The coal-field of Sarvadane, 154 versts (100 miles) southwest of Samarcand, covers a

*Translated from paper entitled 'Richesses Minérales des Possessions Russes en Asie Centrale.' by E. D. Levat. *Annales des Mines*, Tome III, 1903.

large area that is approximately bounded by the villages of Rabate, Péti, Kante, Pasroutt, and the bridge of Pouli-Markate. This region was first explored by Bogoslovsky in 1841, and has been described in the reports of subsequent expeditions. The stratigraphic succession in this field is as follows, beginning at the bottom: (a) calcareous conglomerate, 60 m.; (b) sandstone, 110 m., containing 10 or 12 m. of coal slates; (c) alternating beds of sandstone and coal, the coal-seams ranging from 0.02 to 0.9 m. in thickness; (d) ferruginous conglomerate, sandstone and marls containing coal near the base.

The coal-field of the Arys valley was discovered by a member of the Tashkent-Orenburg topographical survey party. This valley will be crossed by the proposed railroad to connect Turkestan and Siberia, which is to start at Chemkent and pass by the way of Vierny and Semipalatinsk to Taiga, a station on the Siberian line near Tomsk. The coal-seams are found outcropping in the upper part of the Arys valley, and in the valley of the Bougouni, another affluent of the Syr-Darya parallel to the Arys. Samples of coal from this locality have been examined by the Imperial Institute. The coal is brilliant and has a conchoidal fracture. It burns with a yellow flame, yielding an agglomerated coke which contains about 96 per cent carbon and 4 per cent ash. It belongs to the semi-bituminous coals.

The deposits of the Arys and Bougouni valleys are destined to have great importance in the future, not only as a source of supply for the railroad, but also for the market of Tashkent, a city that has taken on a new life as the commercial and political center of Turkestan and the advanced outpost of commerce with Europe. So far, the work of exploring the beds has been limited to shallow open-cuts, which have, however, exposed a number of seams with a maximum thickness of from 1.4 to 2.1 meters.

The important coal-field lying to the west of Semipalatinsk is closely related to the deposits just described. It comprises the following principal basins: Eki-Bastous, Bess-Tubi, Kouou-Tchekou, Lake Balkash and Sergiopol—all of which are situated in the meridians of 70° and 78° east longitude (from Paris) and the parallels of 44° and 52° north latitude. The country is very level, the divide between the Irtish on the north and Lake Balkash on the south being scarcely perceptible.

The basin of Eki-Bastous, which is the best known at present, is connected with the Irtish by a railroad, 120 versts (80 miles) long of standard Russian gauge. There are facilities for handling 100,000 tons on the river during the season of navigation, which is from May to October. The coal measures have been explored by a series of 10 shafts sunk in different parts of the basin, which indicate a total thickness of from 60 to 70 m., with about 4 m. of valuable coal. Sufficient development has not been done, however, to establish definitely the structure of the basin. The coal contains a large amount of ash (from 7 to 18 per cent), but it burns freely without clinkering. It is not adapted to the manufacture of coke, which is unfortunate, as there exist in the region numerous copper and silver-lead deposits that might furnish the basis of an important metallurgical industry. An analysis of coal from Arteminski gave the following results: Carbon, 70.87 per cent; oxygen and nitrogen, 8.70 per cent; hydrogen, 3.99 per cent; sulphur, 0.83 per cent; water, 8.30 per cent; ash, 11.94 per cent. The coal is consumed by the steamers on the Irtish and by the Siberian railroad. There are storage facilities at Omsk for 50,000 tons for supplying the railroad during the winter months, when navigation on the Irtish is suspended.

The coal-field belongs to a geologically recent series, probably the Cretaceous, although its age cannot be definitely determined until further study is made. The strata rest directly upon crystalline rocks, which are exposed on the summits of the low hills that extend from Bayonavo to Karkasalinsk.

Petroleum.—The petroleum deposits of Turkestan, the formation of which has been greatly favored by the enormous development of sedimentary strata and their folded structure in the vicinity of the mountain ranges, are a continuation of the deposits of Persia and the Caspian sea. They are intimately connected with a group of rocks—of widespread occurrence in that country—which Russian geologists call the Turkestan stage. This stage comprises great thickness of limestones, sandstones and marls forming an independent unit in the stratigraphic scale, situated above the upper limit of the Cretaceous system of western Europe, but corresponding to a part of the Cretaceous in America.

The opening of the trans-Caspian railroad has given a powerful stimulus to the exploration of this territory. The Russian government has recognized the prospective importance of its resources by establishing the same laws for governing the development of the petroleum deposits as are in force in the Baku district. In accordance with the general terms of the decree, when one or more successful wells have been put down, the right of exploration is adjudicated, and a definite price fixed upon the output, with the condition that the production each year must exceed a certain minimum under penalty of forfeiture.

Up to 1902 exploratory operations had been undertaken in three districts. The first district is the Narine valley, where a test well is being sunk at the expense of the government. At the time of my visit the boring had reached a depth of only 74 m., and had not yet encountered the first petroleum-bearing series. The second district, south of Kokand, was discovered many years ago; it is now under exploration by wells that are being driven near the village of Liakan, where several deposits of excellent ozokerite have been found. The third district is situated southwest of Margellan, about 18 versts (12 miles) from the railway station of Vannovskaya. Prospecting operations have reached a more advanced stage here than in the other districts mentioned, and they afford the most definite information available as to the future of the petroleum industry in Turkestan.

The existence of petroleum near Margellan was recognized by the natives, who long ago exploited the deposits on a small scale by digging shallow wells. The density of the oil is 0.85. A well has been put down to a depth of 123 sagenes (860 ft.) and yields, by bailing, about 5,000 kg. per day. A successful outcome of the exploratory work in this district will lead to the rapid development and exploitation of the deposits, as the output can be profitably marketed. The freight rates from Baku are 20 kopeks per pood, which would assure the market against competition from that source.

In addition to the above districts, there are other occurrences of petroleum in Turkestan, but little is definitely known at present concerning their character. The native Sartes have exploited deposits in the vicinity of Chirabad, on the road from Patta-Guissar to Samarkand, and also across the Afghan frontier in the same region. Near Merv prospecting has been going on since the Russian conquest, but it cannot be said that any marked degree of success has been attained.

Summarizing the results thus far obtained, it may be said that the indications of petroleum are widespread in this country, but as yet no deposits have been discovered that are at all comparable to those of Baku. I should hesitate to venture the opinion, however, that deposits of great value may not be found in future operations.

PROFITS IN THE MANUFACTURE OF FUEL BRIQUETTES.

In briquetting as well as in every other industrial undertaking, says Robert Schorr[1], the cost of the plant, land, power, labor and raw materials governs the cost of production. The size of briquettes, class of press and nature of binder also have a strong bearing upon the cost of the first installation. The smaller the briquette the higher will be the investment per ton manufactured. The whole machinery for a briquette plant using, for instance, a Couffinhal press, making five tons of 3-kg. briquettes per hour, with 200 kg. pressure per sq. cm., costs about $10,500, which, at 5 per cent interest and 10 per cent allowance for depreciation, would equal a cost of about 4.5c. per ton of briquettes. Taking a Couffinhal plant of a capacity of 7.5 tons of 5 kg. briquettes, with a pressure of from 240 to 300 kg., the machinery costs about $14.000, which is equivalent to a cost of about 4c. per ton, based on continuous working. The cost of erection and buildings, etc., in both cases is about the same. The power for the press, and the auxiliaries per ton of briquettes made per hour, varies from 4 to 8 horse power.

The cost of labor per ton of briquettes in modern plants is in France from 9.5 to 14.3c.; in Germany 12c.; in England from 10 to 12c., and in Austria 13.2c., or an average of 12c. per metric ton. The cost of fuel, lubricants, stores and office expenses abroad amounts, in Germany, to about 20.2c.; in France, to from 8 to 20c.; while for interest and depreciation the cost in France is from 5.8 to 10c., and for binder from 38.6 to 97c., if hard pitch is used. The total cost (exclusive of binder) of briquetting one ton thus varies from 23.1 to 32.8c. in France and from 21.5 to 24c. in Germany. The average cost in England is 24c. The cost of binder forms, as a rule, from 60 to 70 per cent of the total manufacturing cost.

The sales-price of briquettes is entirely governed by the prices and quality of coals against which the briquettes compete; as a rule, it is from 66 to 80 per cent of the price of the best lump-coal, although in some places it even exceeds the higher limit. Much depends on the absolute heating-value of the briquette, for the reason that even the smallest consumer, after looking over his fuel bill, will find out whether it is to his advantage to use briquettes at a certain price or not.

Coal-briquettes sell in Germany at from $2 to $3, and brown-coal briquettes at from $2 to

[1] 'Fuel and Mineral Briquetting'; *Transactions* of the American Institute of Mining Engineers, February, 1904.

$2.50 per metric ton, or about 10 per cent less for the short ton. In making preliminary figures, it will be safe to assume 5c. per ton for interest and depreciation.

For Western American conditions, the following estimate on the cost per ton of briquettes is very nearly correct:

Labor, inclusive of stacking	$0.160
Oil and grease	0.006
Sundry stores	0.010
Steam fuel	0.040
Depreciation	0.050
Total labor, power and supplies	$0.266
Pitch, 8 per cent, at $12 per ton	0.960
Coal slack, 1.840 lb., at $1 per ton	0.940
Total cost per ton of briquettes	$2.166

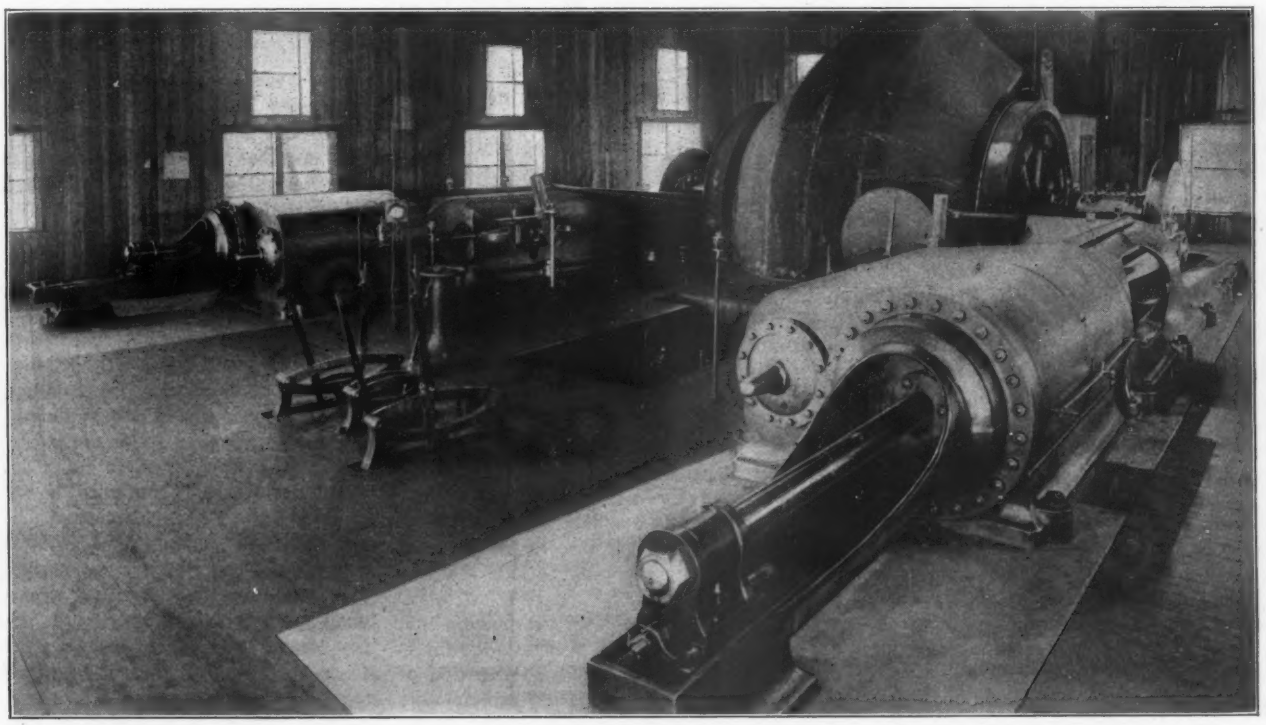
In the East, where coal-slack is almost worthless, the cost of briquettes should be even lower than this figure.

A LARGE WATER-HOIST ENGINE.

Water hoisting by means of tanks is receiving serious consideration by the larger operators in the anthracite coal region, and there are a number of large water-hoisting plants in successful operation.

The illustration herewith, shows a pair of 36 by 60-in. water-hoisting engines, built by the Vulcan Iron Works, of Wilkes-Barre, Pa., and in operation at the plant of the Lytle Coal Company, Minersville, Pa. There are two pairs of these engines at this plant. Each pair hoists from a double compartment shaft, 1,500 ft. deep. The capacity of each cylindrical water tank is 2,600 gal.; the capacity of each pair of hoisting engines is 3,500,000 gal. in 24 hours; a 2-in. wire rope is used. The hoists are equipped with conical cast-iron grooved drums, 10 to 16 ft. diameter, with double brakes, one at each end. The engines have piston valves, with extra large ports and pipes, and tail rods for supporting the pistons. The main bearings are 17 by 36 in.; the shaft is 18 in. in diameter. The engine has steam reverse, steam and hand brakes, and Williams & Kohlbraker's device for preventing overwinding. All steam and exhaust pipes are underneath the floor; levers for operating reverse, brakes and throttle are all mounted upon quadrants, and arranged conveniently with relation to each other. The main steam pipe is 12 in.; to each cylinder 10 in. The throttle valve is of the double disk balanced type, with automatic drain valve. A 12-in. stop-valve back of the throttle is operated by a hand wheel, as shown. The engines are of heavy design throughout, yet work easily and smoothly. They have been in use over two years.

In addition to the two pairs of engines at the Lytle colliery, the Vulcan Iron Works recently erected a pair of the same size of engines at Williamsport, Pa., for the Susquehanna Coal Company.



VULCAN HOISTING ENGINE AT LYTLE COLLIERY.

A NEW PETROLEUM BRIQUETTE.—In Germany, where the briquetting industry is extensive, improvements are continually being made in the manufacture of briquettes. Recently a new briquette was made consisting of 1,000 parts crude petroleum, 150 of soft soap, 150 of resin, and 300 of caustic soda. At about 120° the mass solidifies, when the briquettes are run through a bath which thinly coats them, so as to make them impervious to the elements and very clean to handle.

YELLOW ARSENIC.—According to Erdman and Unruh, in a paper published in the *Zeitschrift für Anorganische Chemie,* the yellow modification of arsenic, observed by several chemists, corresponds to white phosphorus and is produced by rapidly cooling the vapor of arsenic. The yellow powder can be kept indefinitely in the dark at a temperature of -70°, but on exposure to light, even in solution, it rapidly changes to ordinary arsenic. From a determination of the molecular weight the molecule was found to correspond to As_4.

THE MECHANICAL EQUIPMENT OF COLLIERIES.*

By George H. Winstanley.*

A pound of good average British coal, completely burnt, is capable of developing heat equal to about 14,000 thermal units, or considerably more than 10 million foot-pounds measured in work; that is, nearly 5.5 h. p. for each pound per hour, yet with high-class steam engines and boilers the energy developed in the steam cylinders is only about 9 per cent of the energy of the coal, and in average colliery practice it is likely that the fuel consumption is often nearer 20 lb. of coal per indicated horse-power per hour than 2 lb. Stirling water-tube boilers, which have already found a place at well-equipped British collieries, are capable of evaporating under fair average conditions from 10 to 11 lb. of water per lb. of coal, as against from 7 to 8 lb. in a Lancashire boiler under similar conditions. The fuel consumption, ordinarily, is about 16 lb. of coal per sq. ft. of grate area per hour.

As furnace ventilation for a mine is more expensive than fan ventilation, so is chimney draft costly as compared with mechanical draft. In a boiler working at, say, 150 lb. per sq. in., the temperature of the water and steam would be about 360° F., and the hot gases might enter the chimney with a temperature of 650° to 750° F. By an arrangement of pipes in which the cold water is circulated, a considerable proportion of the heat may be utilized in heating the feed-water, as in the Greene economizer; but the cooling of the hot gases may be carried so far that the temperature is too low to produce efficient draft. Hence, a well-designed fan for induced draft is a comparatively inexpensive appliance, and the power for driving it amounts to less than 1 per cent of the power developed by the engines supplied by the boilers. It en-

*Abstract from a paper read before the Manchester Geological and Mining Society, February, 1904.

ables almost any kind of fuel to be burnt; increases the evaporative power of the boiler, so that two boilers with induced draft may equal three boilers of the same size without assistance; enables thick fires to be kept on the grates, and dispenses with a costly chimney.

Pumps and Pumping.—Rotary motion for reciprocating pumps presents the difficulty that there is no pause for the valves to close at the end of each stroke before the reversal of motion. This necessitates a low speed and means a comparatively large pump for a small volume of water. The generally popular three-throw pump for electrical driving does its work well enough up to a certain point, but is heavy and costly in proportion to the water handled. The ideal arrangement is the Riedler pump, with mechanically operated valves, these valves making it possible to apply the rotary motion at high speeds with freedom from shock or slip, and without the large amount of gearing usually found in a three-throw pump. Hence, a comparatively small Riedler pump, with a spur-gear on the crank-shaft and a pinion on the motor-shaft, can deal with as much water as a large set of three-throw pumps. The centrifugal pump, with its high-speed rotary motion is especially suited for direct coupling to an electric motor, and recently high-lift centrifugal pumps have been introduced, made in sizes up to 3,000 gal. per minute, and capable of delivering water to a vertical height of 400 ft. with an efficiency in the larger sizes of over 75 per cent.

Hoisting Engines and Equipment.—A colliery hoisting engine, starting from rest, has to put in motion a mass of 100 tons, or even more; to impart to most of that weight in a few seconds a velocity of possibly 60 miles per hour, maintain this velocity for perhaps half a minute, and in less than a minute from starting bring the whole mass to rest again, with the cages adjusted to within a fraction of an inch. Hence, economy, however desirable, cannot be permitted to take the place of simplicity. An engine capable of developing in so short a period of time, and under perfect control, probably 2,000 h. p., must necessarily be free from complication. Though compound condensing hoisting engines are possible for colliery work, and some excellent examples are in use in Great Britain and abroad, it is questionable whether the increased economy is really worth the extra complication and additional first cost. A pair of single-cylinder engines, with automatic triple-expansion valve-gear, steam-operated reversing gear and auxiliary steam brake, combine simplicity with a reasonable degree of efficiency. A well-designed, plain, cylindrical, built-up steel drum of from 20 to 30 ft. diameter, as light as is consistent with strength, with a balance rope under the cages, would seem to be as satisfactory as the elaborate, costly, and heavy conical spiral drums sometimes advocated.

Hoisting Ropes.—Owing to the speed at which these ropes run and the work they have to do, they should be of maximum strength and quality, say, 100 tons per sq. in. of sectional area of the wire—with a factor of safety of not less than 10. This factor is none too high to provide for the great and sudden variations of strain to which the rope is subjected in ordinary work. In starting and getting up speed, the strain upon the rope often greatly exceeds the weight of the suspended load. The increase of load amounts to 70 lb. per ton for each foot per second in the rate of acceleration. With a loaded cage weighing 7 tons and an increase of velocity at the rate of 10 ft. per second, the actual strain upon the rope would be over 9 tons.

Power Transmission and Distribution.—The advantage of compressed air is its comparative freedom from danger. It is not exactly a convenient system and not economical, as a large portion of the energy developed by the steam engine is used in heating the air. This generation of heat represents loss of energy, and the higher temperature of the compressed air produces what may be described as a false pressure against the engine. The first loss cannot be avoided, the second can be checked to some extent by cooling during compression. The high-class compressing plant of the present day is the two-stage compressor with mechanically operated valves and intermediate cooling, but even with the best possible appliances, with large pipes and well-designed motors, the total efficiency of transmission, as a rule in colliery practice, probably cannot exceed 30 per cent.

Electricity possesses these advantages for power transmission. It is convenient, gives a high useful effect, and its application on proper lines is no more dangerous than the application of energy in any other form. Flexible cables are more manageable and convenient than rigid pipes, and an electric motor occupies less space than an air motor of the same power. Generally speaking, the efficiency of transmission, as between the indicated horse-power of the engine driving the dynamo and the output a mile away, is well over 60 per cent. As regards alternating current, the three-phase system offers advantages, which demand the careful attention of colliery engineers. Electric transmission at high voltage means a greatly reduced loss of energy in transmission and a considerable saving of copper in the cables. Again, the three-phase motor has the great merit of simplicity. It has no brushes, no commutators, no sparking, no complicated winding; it is safe to handle and simple to control. Friction clutches should be provided on gears for underground haulage, to permit the motor being thrown out of gear, as it is sometimes necessary to stop the rope almost instantaneously.

Motors.—The writer is of the opinion that the best and only practical system is the three-phase, because of the simple construction of the motors, their freedom from commutators or brushes and the ease of manipulation of the three-phase current. As motors are high-speed machines, it is of the utmost importance to prevent vibration by having solid foundations. Underground, where the floor is strong, no foundation need be put in, holes for the bolts being drilled in the floor and the bolts grouted with good concrete. The situation should be as dry as possible, and every means should be adopted to keep the motor free from dust. A double pole-switch and feed-wire should be inserted between the starting switch and the mains, to protect the motor in case of any over-loading. Motors of the enclosed type are frequently recommended for mine use on the ground that there is less danger of igniting gas by sparks, and that dust and damp are excluded; but in such motors the tendency to heat is great, and inspection is made difficult. As regards sparking, several types of motors run sparkless, and the motor should not, of course, be used in a gaseous atmosphere. It is easy to keep the motor-room of a fixed motor free from gas. With coal-cutting machines, where sometimes gas may come unexpectedly and in dangerous quantities, the motor should be kept in good running order, and built of such a size as to prevent overloading. The motor may also be protected in a dangerous place by being fitted with a covering, provided with holes at convenient places, these holes being covered, or fitted, with strong wire gauze. Such a covering would admit of some ventilation, and keep down the temperature of the motor while running. Electric motors for rope-haulage underground are highly advantageous, and should have serious consideration, where a new plant is to be put in or an old one renewed. Their advantages are smoothness of starting, uniform speed and complete control. A reversal is easily accomplished; in fact, the electric motor meets every condition encountered by an ordinary steam or compressed engine. The application of electricity to secondary haulage is a matter for serious consideration by all colliery managers.

ANTHRACITE COAL IN AUSTRALIA.

By John Plummer.

Although there are deposits of anthracite coal in various parts of the Australian commonwealth, the fuel, generally speaking, is too heavy and otherwise unsuitable for commercial purposes. In central Queensland, however, several seams have been discovered from which useful results are anticipated. They are situated in the vicinity of the Dawson river, where an anthracite coal prospecting company is carrying on extensive operations in a comparatively unexplored district. The first bore sunk by the company gave promise of success, striking coal at a depth of 50 ft., the seam being 8 ft. in thickness. Continuing the bore, coal was again struck 200 ft. below the first seam. This proved to be anthracite of high quality, the seam being 10 ft. thick. Boring operations are to be continued, in the hope of striking a third and larger seam. There had been previous experimental bores, the existence of coal being ascertained. Another company, a few miles distant, is also obtaining good steam coal, and there can be no question that seams of coal exist over a wide area. In fact, central Queensland is believed to contain an extensive coal-field.

Both companies mentioned above have sought to have their coal subjected to exhaustive tests. The Central Queensland Steam Coal Company supplied the war-ship *Mildura*, of the Australian squadron, with 100 tons of anthracite, which experts declared "to be similar in all respects to the best quality of Welsh steam coal." It was also tried with the supply of air that is requisite for this class of coal, when it burned freely, leaving but little ash. Unfortunately, there exists in the British navy a regulation which forbids the use of forced draft with Australian coal on the vessels of the squadron. The tests were sufficiently encouraging, despite their incomplete character.

The operations of the two companies promise to be commercially successful. At present everything is in the initial stage.

Mining in the Globe district of Arizona was started by the location of the Globe claim, now part of the Old Dominion mine, in 1874.

IRON AND STEEL PRODUCTION IN FRANCE.

A brief preliminary statement, issued by the Comité des Forges, shows that in the year 1903 there was a considerable increase in the production of iron and steel in France. The pig iron made is reported as follows, in metric tons:

	1902.	1903.	Changes.
Foundry iron	419,543	569,239	I. 149,696
Forge iron & steel pig.	2,007,884	2,258,429	I. 250,545
Totals	2,427,427	2,827,668	I. 400,241

Nearly all this iron is made with coke, only a few thousand tons of charcoal iron being produced.

The production of wrought iron for the two years was as follows, also in metric tons:

	1902.	1903.	Changes.
Charcoal forges.....	5,580	6,388	I. 808
Puddled iron	401,272	384,428	D. 16,844
From scrap, etc.....	218,974	205,115	D. 13,859
Totals	625,826	595,931	D. 29,895

Of the wrought iron reported last year 45,995 tons were in sheets and plates; 549,936 tons were bars, angles, shapes and merchant iron.

The production of steel ingots for the year was as follows:

	1902.	1903.	Changes.
Converter	1,014,934	1,172,984	I. 158,050
Open-hearth	620,366	681,636	I. 61,270
Totals	1,635,300	1,854,620	I. 219,320

The report does not distinguish between acid and basic steel. The larger part of the French output, however, is acid steel.

The principal descriptions of finished steel products were as follows, in metric tons:

	1902.	1903.	Changes.
Bars & merchant steel.	653,931	792,702	I. 138,771
Plates and sheets.....	276,287	290,204	I. 13,917
Rails	301,434	234,494	D. 66,940
Totals	1,231,652	1,317,400	I. 85,748

The statement of finished products is not quite complete, full statistics not being collected for some minor descriptions of material.

THE GERMAN STEEL SYNDICATE.

The organization of the German Steel Syndicate, which was in doubt for some time, has now been finally completed. The syndicate is not a consolidation of the companies, but takes the form of a corporation known as the Stahlwerksverband, with a capital of 400,000 marks, which is a selling company only, and will act as sales agent for all the concerns in the combination, each of them holding some of its stock. The companies which have united in this arrangement include the principal manufacturing concerns in Germany, their total output last year representing 83.5 per cent of the entire German production. Among these concerns are those of Krupp, Bochum, Hoerde, de Wendel & Company, the Konigs-und-Laurahütte and others of equal importance. . Two large companies, the Phoenix, at Ruhrort, and the Westfalische, are not included, but negotiations are pending, and it is believed that they will eventually join the syndicate, which will then control 90 per cent of the whole German steel output.

The management of the syndicate will be in the hands of an executive committee of eight representatives of the leading works, the chairman being Herr A. Kirdorf, of the Aachener Company, at Rothe Erde. The corporation will have power to apportion the quota of production to each concern, which is to be governed by the demand. It will also have control of all export trade, and of the prices to be fixed for such trade, and of the drawbacks allowed on foreign business.

The steel production is to be divided into four classes: (1) crude steel and muck-bar; (2) purchases by works for their own use of crude steel and semi-rolled products, such as billets and the like; (3) the entire production for sale of billets, rails, rail fastenings, angles, channels, shapes and plates: (4) bars, hoops, plates, axles, tires, forgings and steel casting. For classes one, two and three the entire business will be in the hands of the syndicate; but each company will sell for itself those under No. 4.

This arrangement will place the German steel business practically under one head, specially so far as export business is concerned. For foreign trade it will give increased facilities for competition, with other nations, at the same time restricting that among German firms.

It is also stated that the Steel Syndicate has come to an understanding with the coal and coke syndicates; in consequence of which the latter will withhold the drawbacks now allowed on coal and coke to works which are manufacturing for foreign trade, from any company which is not in the syndicate. This, of course, will be used as an additional inducement to other firms to join the new combination.

COAL RESOURCES OF THE AMERICAN YUKON.

'The Coal Resources of the Yukon' is the subject of *Bulletin* No. 218, of the United States Geological Survey, which has just been published. The author is Mr. Arthur J. Collier, who, with two assistants, spent the summer of 1902 in examining the coal deposits along the Yukon river in Alaska. While the greater part of the investigation was confined to the actual river bank, yet the work was extended away from the stream when time and circumstance would permit. Nearly all the known coal-beds accessible from the Yukon were examined. The purpose of the present report is to summarize the economic results of the investigations of the coals, and to consider briefly their commercial bearing. The steamers plying on the Yukon—in 1898 and 1899 they numbered nearly 100—have up to the present time depended for fuel on wood cut and piled on the river banks. A few of the river steamers now burn coal altogether; others burn both coal and wood. Up to the present time wood has been easily obtainable near the river banks, but since the timber of the Yukon is small and of slow growth, the supply is limited, and the woodcutters have been obliged year after year to bring the wood a greater and greater distance to the river. Coal mines have been operated at a number of points. Those in operation during 1902 are located at Five-Finger Rapids and Cliff creek, both in Canadian territory, and at several points near Nulato, in American territory. This coal has been burned with varying success by steamers.

The coal deposits of the Yukon are discussed under three divisions—those of the Circle province, the Rampart province and the Nulato province. Descriptions of the beds and analyses of samples are given in detail. All the coals that have been mined in the Yukon basin are either high-grade lignites or rather low-grade bituminous coals. With only one exception, all the coals examined in Circle and Rampart provinces are lignites, or at least lignitic, those of the Circle province probably being of a little higher grade than those of the Rampart province. All the coals examined in the Nulato province fall within the bituminous grade. Many steamboat men prefer the lignitic coal from Cliff creek mine, in the Circle province, to the coals from the vicinity of Nulato, as the former burns more freely and produces heat more quickly than do the coals of the lower river.

The workings of the mines are of very limited extent. Timber is convenient, and ventilation is easily obtained by air-shafts to the surface. No trouble with gas has yet been experienced, and safety lamps have not been required. Care must be exercised with the lignites of the Circle and Rampart provinces to prevent spontaneous combustion of the coal after it is mined, and instances are reported of the beds taking fire. With one exception, the mines along the Yukon in American territory are not equipped with bunkers or other conveniences for loading the coal on the steamers. It is piled on the river bank and loaded with wheel-barrows.

The whole amount of coal produced in American territory along the Yukon has probably not exceeded 9,000 tons, representing a value of about $76,000. The future development of the Yukon coal resources probably depends much on the practicability of using oil as fuel on the Yukon steamers.

Because of the limited extent of the coal-beds of the Yukon, the character of the coal, the cost of mining, and the distance of the mines from a market, they will never afford coal for export, but with proper development they will probably be sufficient to supply all local demands that are at present foreseen.

THE AFRICAN PHOSPHATE TRADE.

Shipments of phosphates from north Africa in the past year were large, chiefly the result of great activity in Tunis, where the Compagnie des Phosphates de Gafsa increased its exports from 65,209 metric tons in 1899 to 358,471 tons in 1903. An increased export trade was also done through the port of Boné in Algeria, and, adding the smaller shipments from Bougies, the total increased 113,719 tons, or over 21 per cent. Prices were higher, namely: 63@70 per cent rock, 4.5 to 6.25d. per unit ($5.98 to $8.31 per ton); 58@63 per cent, 4.25 to 6d. ($5.10 to $7.20); 53@58 per cent, 4.125 to 5.875d. ($4.62 to $6.58). Ocean freights to European ports were 6s.@8s. 6d. ($1.44@$2.04) from Boné, and 7s.@10s. 6d. ($1.68@$2.52) from Sfax, Tunis. These rates are considerably less than American exporters pay to the same markets.

In detail the African exports in 1902 and 1903 were as below, in metric tons:

Destination.	1902.	1903.	Changes.
Austria	7,650	11,500	I. 3,850
Belgium	3,850	20,080	I. 16,230
France	172,739	190,660	I. 17,921
Germany	78,986	79,283	I. 297
Great Britain.....	106,290	160,229	I. 53,939
Holland	28,230	34,676	I. 6,446
Italy	80,396	99,584	I. 19,188
Russia	5,400	12,080	I. 6,680
Spain	7,530	13,820	I. 6,290
Other countries.....	25,336	14,090	D. 11,246
Total, Boné and Sfax	516,407	636,002	I. 119,595
Bougies exports.....	17,720	11,844	D. 5,876
Grand total.....	534,127	647,846	I. 113,719

These prosphates, both from Algeria and from Tunis, pay an export tax to the local governments.

RECENT LITERATURE OF ECONOMIC GEOLOGY—VIII. FUELS.

By H. Foster Bain.

Recent Work in the Bituminous Coal Field of Pennsylvania. By M. R. Campbell. *Bulletin* 213, United States Geological Survey, pp. 270-275. *Brownsville-Connellsville Folio; Masontown-Uniontown Folio; Indiana Folio.* By F. B. Richardson.

During the past four years the United States Geological Survey, in co-operation with the State, has been engaged in a geologic survey of the bituminous coal-fields of Pennsylvania. Reports on five of the quadrangles so far surveyed are included in the three folios listed above. In this work attention has been concentrated on the geologic structure of the region. Accurate topographic maps have been prepared and upon them the geologic formations and the coal outcrops are laid down. By means of structural contours, based upon hundreds of observations and careful compilation of drill records, the anticlines and synclines are also represented in unusual detail. The area so far surveyed covers nearly the whole of the Connellsville coke-field, a position of the gas-field of the Irwin or Port Royal basin, much of the territory along the Monongahela and Youghiogheny rivers, considerable portions of Armstrong and Indiana counties, and parts of Butler and Beaver counties.

The territory surveyed in the Monongahela valley includes two or three prominent gas-fields and a few small pools of oil. These gas-fields are usually found on the crests of the anticlines, and it is possible they may be extended along the axial lines. The highest point of the Fayette anticline, near Jacobs creek, has never been tested by the drill, and it is possible that a new field may be developed at this point. From a structural standpoint it is very promising. Reports on the Waynesburg and Latrobe quadrangles are now in press.

In the Allegheny valley few changes have been made in the determinations of the Second Pennsylvania Survey. The opinion is prevalent among oil-men in this region that the pools bear no definite relation to geologic structure. As formerly determined, the structural lines in the vicinity of Brady's Bend trend regularly about 35° E., while the oil-pools run nearly at right angles to this. The recent studies show that the structure, when properly represented, is in entire harmony with the pools as located by the gas-men. One of the most pronounced changes is in the interpretation of the Brady's Bend anticline. The folds formerly known as the Brady's Bend, Kellersburg and Anthony's Bend are shown to be parts of one somewhat irregular fold. In eastern Armstrong county a similar change in interpretation results from the discovery that the Bagdad, Greendale and Glade Run anticlines form one continuous fold. One of the most pronounced errors in the previous determinations of the structure of the region occurs in Indiana county, where numerous diamond-drill holes show a pronounced syncline through the town of Indiana, where an anticline was formerly supposed to exist.

The direct results obtained during the course of these surveys are regarded as important contributions to the economic geology of the coal-field of the present decade.

Very pure asphalt occurs in the Dead Sea. In ancient times it was used as water-tight cement in buildings, and for embalming Egyptians.

BOOKS RECEIVED.

In sending books for notices, will publishers for their own sake and for that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of the Engineering and Mining Journal.

Les Amalgames et leurs Applications. By Leon de Mortillet. Paris, France: Bernard Tignol. Pages, 52.

The Columbian, 190. New York; Prepared and Published by the Junior Class of Columbia University. Pages, 320.

Records of the London and West-Country Chamber of Mines. Volume II. *Part* 9. London, England; published by the Chamber. Pages, 32.

Geological Survey of Canada. Altitudes in the Dominion of Canada. By James White, Geographer. Ottawa, Canada; Public Printer. Pages, 266; with map.

Polar Climate in Time, the Major Factor in the Evolution of Plants and Animals. By G. R. Wieland. Reprinted from the *American Journal of Science.* Pamphlet, 30 pages.

Anniversary Address of the President of the Royal Geological Society of Cornwall. J. H. Collins, President. Reprinted from the Transactions of the Society. Pamphlet, 10 pages.

Statistical Abstract of the United States. 1903. Prepared by the Bureau of Statistics under the Direction of the Secretary of Commerce and Labor. Washington; Government Printing Office. Pages, 650.

Southeastern Alaska and Part of British Columbia; Showing Award of Alaska Boundary Tribunal. Scale 1:960,000. Prepared for the Canadian Boundary Commission. Ottawa, Canada; issued by the Department of the Interior.

Canada. Map of the Northwest Territories and the Province of Manitoba. Scale 1:792,000, or 12.5 miles to 1 inch. Prepared by James White, Geographer. Ottawa, Canada; issued by the Department of the Interior. In four sheets, each 25 by 35 in.

BOOKS REVIEWED.

Handbuch der Eisenhuttenkunde. Parts I., II and III. Fourth Edition. By A. Ledebur. Leipzig, Germany: Arthur Felix. Pages (the three parts), 1,160; illustrated. Price (in New York), $14.50.

The well known treatise of this distinguished author is so much of a classic in the literature of iron and steel metallurgy, and is so highly appreciated by all who are engaged in that art, that little remains to be said in commending the fourth and recently published edition. The third edition appeared in 1900. The fact that a fourth edition of a work of such magnitude has been demanded in so short a time bespeaks the position which it holds in its special field.

This treatise is divided into three parts. The first is introductory. The second treats of pig iron and its production. The third treats of wrought iron and its production. The fourth edition is prepared on the same lines as the third, but brings the latter up to date. The compass of the work has been increased from 1,086 to 1,160 pages, and the number of illustrations from 366 to 407. The profession is indebted to Prof. Ledebur for undertaking the work of revision, which now puts a thoroughly modern treatise on the metallurgy of iron into the hands of the students and technologists who are engaged in that subject.

L'Or en Guyane Vénézuélienne. By Norbert Paquet. Liege, Belgium, 1903; Bureaux de la Revue Universelle des Mines. Pages, 142; with maps and illustrations.

A welcome contribution to our literature on the resources and mining of gold in Venezuela is found in this paper. The district described is that known as Venezuelan Guiana, situated between the Orinoco and the Rio Cuyuni, about which very little information has been published in the last twenty years. The district contains important deposits of both alluvial and lode gold, and contributes a large quota to the total production of gold in that country, although apparently the industry has shown a considerable falling off, as regards output, in the last decade. The author of the paper spent several years in that country making investigations of the different mines.

Elektro-Metallurgie. Third Edition, 1903. By Wilhelm Borchers. Leipzig, Germany: S. Hirzel. Pages, 578; illustrated.

This new edition of a work which is already a classic in metallurgical literature presents the treatise in an entirely re-written and greatly expanded form. It summarizes the recent developments in electro-metallurgical theory, which have been very important, and the advances in electro-metallurgical practice, which have been no less important, and records the results of much valuable experimental work which has been carried out in the well equipped electro-metallurgical laboratory at Aachen, that is under the direction of the distinguished author. In its present form, his treatise is probably as fully up to date as a work of its kind can ever be expected to be, especially in treating of an art which has only just passed its infancy and is now making giant strides every year. Under such conditions it is inevitable, because of the exigencies of book-making, that the author should be somewhat behind his subject at the time of the publication of his work. This is probably the explanation of certain apparent shortcomings in the present edition.

Dr. Borchers continues to write in the positive and authoritative manner that has characterized his previous editions. He has the courage of his convictions and does not hesitate to express his opinions, favorable or unfavorable. This is refreshing and valuable, because the opinions of a metallurgist of his authority carry weight. We think, however, that he sometimes displays a personal prejudice which in the interest of the scientific spirit might well be modified. As he writes in his preface, the failures in practice are often more instructive than the successes, but we do not think that in his text he always develops this idea with the fairness and absence of bias that ought to be expected.

It goes almost without saying that every one who possesses either of the former editions of this work ought to replace it with the present edition, and every one who is interested in electro-metallurgy ought to have it in his library.

The Gold Mines of Western Australia. By Herbert J. Daly. London; reprinted from the *Financial Times.* Price, 1 shilling, or 25 cents.

This is a neat pamphlet of 32 pages, giving the latest account of progress at the mines of an important gold-producing region, by an engineer of good standing. Useful maps and one fine photograph of Kalgoorlie are added. To those who take an interest in Western Australian mining this pamphlet, carefully and pleasantly written, will prove a desirable acquisition.

The Metallurgy of Steel. By F. W. Harbord. With a Section on *Mechanical Treatment of Steel.* By J. W. Hall. London, Charles Griffin & Company, Ltd. Philadelphia, the J. B. Lippincott Company. Pages, 760; illustrated. Price, $9.

The work furnishes a very full description of the manufacture of steel and will be welcomed by metallurgists and engineers alike. For convenience of treatment, the subject is divided into four distinct parts: I. The Manufacture of Steel. II. Re-heating. III. The Mechanical Treatment of Steel. IV. Finished Steel.

In writing his book, Mr. Harbord, as he explains in the preface, found that it would take a fully qualified engineer to do justice to section III. He, therefore, placed this part of the work in the hands of Mr. J. W. Hall, while section II has been written by them jointly, because, in this part of the subject, metallurgical and engineering interests are combined.

In part I the first subject considered is the bessemer process, which is very carefully discussed, the section on the chemistry of the process being both clear and forcible. After a description of gas-producers, the open-hearth process is dealt with, and many references to American practice are given. Part I ends with chapters on the production of steel castings, of shear and crucible steel, armor plate manufacture, and direct processes for steel.

Part II covers about 30 pages and deals with re-heating furnaces and the handling of material. In part III, on the mechanical treatment of steel, Mr. Hall has collected a mass of valuable information, and on account of the clearness of treatment and profusion of illustrations, this section will prove of great value, especially to the student.

The last section deals with finished steel and, after going into the problem of mechanical testing, takes up the question of carbon and iron, the influence of silicon, sulphur, phosphorus, etc., steel alloys and heat treatment. The constitution of steel has been clearly and carefully written up and goes far to explain the differences of opinion so numerous on the subject. The allotropic, carbon and sub-carbon theories are set forth briefly, while a paragraph or two on the solution theory draws a parallel between copper-silver alloys and steel.

The last chapters of the book, on the microscopical examination of steel, are especially good, though it seems rather a waste of time and space to describe each different worker's method of obtaining a polished surface. After all, the method of procedure in polishing is quite unimportant, so long as one ends in obtaining a perfect surface ready to etch. No two workers use exactly the same method, and to call a method by the name of each worker along this branch of research would be absurd. Of course, we should expect stress to be laid on anything out of the ordinary, as for instance, Osmond's 'polish-attack,' etc. Again, in etching, each one follows his own bent and it is really a matter of the personal equation, but results to be valuable ought to be uniform.

The various constituents of steel are clearly described, namely, ferrite, cementite, pearlite, etc. It seems a pity that we cannot have some recognized nomenclature on the subject. In this book, martensite and austenite have their original definitions. Yet, according to Howe's present views ('Iron, Steel and other Alloys'), the term 'martensite' has been dropped and 'austenite' used to denote the solid solution phase above Ac_1.

One feature to be commended is the collection of photo-micrographs at the end of the book, grouped according to percentage of carbon. Thus, on one page we can see the appearance of, say, 0.13 per cent carbon steel as rolled, re-heated, water-quenched, oil-quenched and oil-tempered, both at a magnification of 150 and 1,500 diameters.

The book is to be specially commended for clearness of treatment, each different heading being distinctly marked, and for the number of illustrations it contains. As one would expect, the main treatment is from an English standpoint, but numerous references to American and Continental methods are made. Speaking generally, this treatise is delightfully written, and will prove a valuable help to the metallurgist and to the engineer, while to the student it will be the source of much information easily found, and readily understood, for it is written in language which all can comprehend.

CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

A Question of Postage.

Sir.—The fact that I have recently received from your side a large number of letters insufficiently prepaid—that is, bearing a 2c. stamp instead of a 5c.—leads me to suggest that many people over there are either ignorant or careless of International postal regulations; possibly owing to their extreme insularity. It may come as a shock to the average American to be told that he is "insular;" he is, however, undoubtedly very much more insular than the Englishman—only his island happens to be a trifle larger! A communication has just reached me in an official envelope, printed "Dep't of the Interior, U. S. Geological Survey, Official Business," upon which no postage whatever had been paid. Possibly my correspondents may be only anticipating history by a few hundred years, but at present letters in the official envelopes of the United States Department of the Interior are not regarded by the British Post Office as franked communications.

OLD SUBSCRIBER.

London, March 23, 1904.

Radium in Zinc-Blende.

The Editor:

Sir.—I notice in your issue of March 17 a query about radium in zinc-blende. Having given some attention to the matter, I would say that, so far, I have not detected radioactivity in blende, and I doubt whether chemical analysis in the hands of the ordinary analyst could be relied on for its discovery with anything like the certainty afforded by the electroscopic method which I have been using for some months. If your correspondent cares to send on a sample, say a lump of 2 or 3 oz., I shall be pleased to test it for him. The sample must be sent by mail, fully prepaid.

S. DILLON MILLS.

Toronto, Ont., March 25, 1904.

ABSTRACTS OF OFFICIAL REPORTS.

Delaware & Hudson Company.

This company, in addition to an extensive railroad system operated, owns and works a large coal estate in the Wyoming district of the anthracite region. The larger part of its output is carried northward and northeastward to Canada and northern New England. It owns no lines to tidewater, its coal for that destination being shipped over the Erie railroad from Honesdale to Newburg and New York. The report is for the year ending December 31, 1903.

The company mined during the year 5,979,311 tons of anthracite coal. At the end of the year it had on hand 307,145 tons. In 1902 the quantity mined was only 3,127,698 tons, the small quantity being, of course, due to the strike.

The statement of earnings and expenses of the coal department for the year is as follows; the average being based on the total tonnage mined:

	Amount.	Per ton.
Coal sales at mines	$163,417	...
Coal sales to R. R. dept.	903,999	...
Coal sales at other points	18,461,618	...
Total sales	$19,529,034	$3.44
Coal added to stock	654,197	2.13
Total receipts	$20,183,231	$3.37
Mining and preparing coal	$11,528,821	$1.93
Coal purchased	24,035	...
General expenses	186,498	0.03
Railroad transportation	4,703,997	0.79
Handling expenses	119,775	0.02
Taxes, etc.	69,479	0.01
Total expenses	$16,632,605	$2.78
Net earnings	$3,550,626	$0.59

The total expenses were 82.4 per cent of the gross earnings. The expenses were made up as follows: Mining and purchase of coal, 69.4 per cent; transportation, 28.3; general and miscellaneous, 2.3 per cent.

The sinking fund of 5c. per ton on coal produced during the year amounted to $268,165, of which $83,613 was charged for expenses, the balance of $184,552 being charged against net income. In addition to this sinking fund, the sum of $97,520 was charged off for depreciation of coal handling and storage plants, and $188,634 for depreciation of mining plants, washeries, etc. Extensive improvements were made in the coal department at a total cost of $1,259,394, the largest item being $326,457 for new breakers. Other large expenditures were for new engines, electric plants, mechanical haulage in collieries, air compressors and for sinking shafts.

The company's railroad lines carried during the year a total of 8,657,966 tons of anthracite coal; other mineral freights reported were 1,018,791 tons of bituminous coal, 45,897 tons of coke, 354,399 tons of iron ore, 487,067 tons of stone, sand, clay and similar material.

The total earnings of the company, including the coal department and railways, for the year amounted to $34,186,370. The net earnings, after deducting working expenses, were $7,094,207; deducting from the latter, interest, rentals and other charges, a net balance remained of $3,914,794, which is equal to 11.2 per cent on the capital stock. The dividends paid were 7 per cent on stock, amounting to $2,450,000 in all; the balance of profit having been applied to improvements and additions to the property.

Atlantic Mining Company.

This company operates a copper mine in the Lake Superior mining district, in Michigan. The earnings and expenses for the year 1903, which was covered by the report, were as follows, with the averages per pound of copper:

	Amount.	Per lb. copper.
Copper sold	$722,386	13.12
Working expenses at mine	$517,384	9.39
Smelting, freight, etc	68,767	1.25
Exploration and construction	10,893	0.20
Total expenses	$597,044	10.84
Net earnings	$125,342	2.28

In addition to the net earnings for the year, as shown above, the sum of $25,000 was received for sale of land. The surplus carried over from 1902 was $94,101, making a total surplus at the close of the year of $244,443. The total exploration work included 225 ft. sinking shafts, 6-ft. forks, and 6,961-ft. drifting. The average cost of shaft sinking was $22.80 per linear ft.; forks, $14.45; drifting, $5.40 per ft. The average cost of stoping was $4.17 per fathom. In addition to the rock reported stamped for the Atlantic mine, the mill treated 51,435 tons of rock from the Winona. The report gives the mining and working costs in excellent detail.

Some results of operation are given in the following table:

Ground broken in openings and stopes	27,063 fathoms
Rock stamped	431,397 tons
Product of mineral	7,670,660 lb.
Product of refined copper	5,505,598 lb.
Refined copper per cubic fathom broken	203 lb.
Yield of rock treated, 12.76 lb. per ton, or	0.638 p. c.
Gross value of product, per ton of rock treated	$1.6748
Cost per ton of mining, selecting and breaking, and all surface expenses, including taxes	$0.9191
Cost per ton of transportation to mill	0.0563
Cost per ton of stamping and separating	0.2239
Cost per ton of working expenses at mine	$1.1993
Cost per ton of freight, smelting and marketing, including New York office expenses	0.1497
Cost per ton of running expenses	$1.3490
Total expenditure (including construction) per ton of rock treated	1.3840

The directors' report says: "The average yield of the rock treated during the year was 12.76 lb. of refined copper per ton, against 11.09 per ton in the previous year. This gain in the yield, together with an increase of nearly 1.25c. per pound in the price obtained for the copper, has resulted in a fair profit on the year's operations and a corresponding increase of the surplus fund, or working capital, which had been considerably diminished in 1901 and 1902, and we have been enabled to pay off most of the indebtedness then incurred.

"The present appearance of the mine seems to warrant the expectation that the yield of the rock mined during the past year will be maintained during the current year. The explorations on Section 16 in search of the Baltic lode have not so far been successful, and have been discontinued for the present awaiting the result of the extension of the workings in the Baltic mine toward that section, which may shed some light on the situation.

"We have sold the surface right to a portion of our property on the shore of Portage Lake, near the site of our old stamp mill. This land is to be used as a site for smelting works to be owned by the Michigan Smelting Company, and we have received in payment therefor the sum of $25,000, in the stock of that company. Our investment in this stock will secure a lower rate for smelting than has hitherto been paid, and as the entire capital stock of the Michigan Smelting Company will be held by companies closely allied in management, and in amounts proportioned to their respective outputs, all benefits arising from their co-operation will be equitably shared."

Borax Consolidated, Limited.

With a share-capital of £1,400,000, yielding annual dividends of 5.5 per cent on the preferred and 17.5 per cent on the common stock, and a bonded indebtedness of £1,150,000, carrying interest at 4.5 and 5 per cent, this combination has extensive borax mines and refineries in the United States, South America, Great Britain, France, Austria and Turkey.

On September 30, 1902, the mines, equipment and railways, together with the good-will required by the consolidation, were valued at £2,274,515, while the stocks at mines, factories and in transit, were credited at cost, £224,478. The expenditures for inspecting and developing the properties during the year were £19,681; first debenture stock redemption fund received, £27,918; advances and investments, £311,497; sundry debtors, £62,922; bills receivable, £3,193; cash at bankers, etc., £118,881.

The profits for the year have been increased by the good sales made in the various countries. After providing for all management and administration expenses in 1903, there was a net profit of £266,270, which is £8,000 more than the average annual profits in the past five years. Adding £11,857 brought forward from 1902, makes a total of £278,127, from which deductions have been as follows: Interest on debentures, £52,500; interim dividend on preferred shares paid May 1, £22,000; interim dividends on ordinary shares paid May 1 and August 1, £30,000; income tax, £2,985; depreciation reserve credit, £17,500; debenture stock redemption fund, £5,825; total, £130,810, leaving £147,317 to be dealt with. Of this balance, a final dividend on the preferred stock, and the third interim dividend on the ordinary, were paid November 1, absorbing £37,000. From the remainder of £110,317 the directors propose to pay a final dividend of £1 per ordinary share, less income tax, or £60,000, making 17.5 per cent for the year; to place to general reserve, £20,000; to write off the year's expenditure on inspection and development of properties, £19,681; and to carry forward, £10,636.

In the report, attention is called to the change in title of the depreciation reserve account to "buildings, plant, etc.," to make it clear that this fund is not intended as a reserve for the exhaustion of mineral. The properties of the company, say the directors, are so extensive that the possibilities of exhaustion need not be considered. The company's engineer reports that on one property alone there are at least 5,000,000 tons of borate of lime.

QUESTIONS AND ANSWERS.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc.; preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Fine Crushing.—I am anxious to get information as to what people are crushing to 80-mesh, and the methods and costs. Can you put me in the way of getting such information?—F.

Answer.—We do not know of anyone who is crushing all material to 80-mesh. Of course, some part of the ore will be crushed to that degree of fineness, when the intention is to make a coarser product; but that is only done incidentally.

Possibly some of our readers may know cases where crushing is done to 80-mesh. If so, we shall be pleased to have them send us such information as may be available about the work.

Prices of Black Diamonds or Bort.—Can you not publish in your list of prices quotations of diamonds, carbons or bort, such as are used in diamond drills? At present we are dependent upon agents for our supply, and have no means of checking their prices.—Driller.

Answer.—We would like to comply with your request, if possible, and publish quotations of drill diamonds or bort. Unfortunately, however, it is impossible to get any regular or general quotations. The price varies very much, on account of the somewhat irregular supply of these diamonds. Even if any given date is taken, the price will vary widely according to quality and size. Any attempt to give a general quotation would be misleading; or else the range of prices would be so wide that it would afford no real information. For these reasons, we have not published any quotations in our list, and we fear that it will not be possible to publish any.

Amending Location.—A locator, after locating, staking and recording a group of claims, finds that some of the claims are too wide, and others too narrow; can he rectify the error without making an amended location, providing he does not take in new ground or interfere with the rights of others, or change the direction in any way whatever?—H. O.

Answer.—A comparison of authorities shows that the courts allow considerable discretion in amending any defects in the original location. The difficulties in the way of making a correct location may be often considerable, and for these due allowances will be made. It is only required that such changes shall not affect the rights of others. The authorities, however, also seem to concur in the view that it would not be safe to make such changes without filing an amended certificate of location. It would, therefore, be best to apply for an amended certificate in accordance with the usual procedure. The necessary forms can be obtained from the recording office of the district.

RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

SPECIALLY REPORTED.

BLAST-FURNACE FLUE-DUST—INJURY TO ADJOINING PROPERTY.—In this case, suit was brought by E. R. Sullivan and wife against the Jones & Laughlin Steel Company in 1902, it being charged that by the frequent emissions of ore-dust from the Eliza furnaces their property was greatly depreciated in value, and trees and shrubbery killed. It was testified that, owing to the necessity of using a large percentage of Mesabi ore, slips were frequent and that no method had yet been devised for preventing the emission of this ore-dust from the furnace stacks at the time of slips and explosions. Witnesses for the defendants testified that they were experimenting with a process by which their ores were to be briquetted before being charged into the furnace and also with a new furnace top. About a year ago the lower court handed down a decision dismissing the bill, but the case was carried to the Supreme Court where the decision was reversed, although the judges stood four to three on the decision. In the decision the Supreme Court says, in part:

While the right of the company to locate and operate its furnaces in a manufacturing district of the city of Pittsburg must be conceded, there is a right in the appellants entitled to no less recognition and protection by the law, and that is the one they have exercised, of erecting houses on their lands in a residential portion of the same city.

If this bill were for relief from personal inconvenience and interference with the appellants' full and free enjoyment of their property, due merely to the conditions of smoke and dust that have existed for years and will exist as long as the city itself continues to be the great steel and iron manufacturing center, it would be promptly dismissed. Of the smoke and dust now coming from all the other surrounding mills and furnaces no complaint is made, and of what used to come from the old furnaces of the appellee the appellants made no complaint, and would not be complaining now but for the changed conditions brought about by the appellee. The court below, though requested by it, refused to find that "The matters complained of by plaintiffs are only such discomforts and inconveniences as are, and always have been, incident to and consequent upon close proximity to an exclusively manufacturing section of a manufacturing city."

The court below found that "the use of Mesabi ore in the manufacture of pig iron seems to be a necessity." At the same time it refused to find, as requested by defendant, that "it is to-day a practical and commercial impossibility for manufacturers of iron and steel to obtain a supply of ores for their blast furnaces other than by the use of Mesabi ores." There is a finding: "That appliances have been suggested for the purpose of diminishing or preventing dissemination of ore dust from furnaces. These appliances, however, have not been generally adopted by operators. The defendant company, however, has recently entered into a contract with the patentee of one of these appliances, known as the closed top, for the placing upon at least one of their furnaces of that design. It has also entered into a contract for the construction at its furnaces of a plant for the briquetting of Mesabi ore, with the end in view of preventing slips, and thereby avoiding the escape of dust into the atmosphere. The success of these devices is not assured, they being to a great extent matter of experiment." It is therefore by no means certain that the appellee will not be able to obviate, as is his duty, the continuance of the great injury done to the appellant either by substituting another ore for the Mesabi ore, or by adopting appliances that will prevent escape of dust from slips.

The right of a man to use and enjoy his property is as supreme as his neighbor's, and no artificial use of it by either can be permitted to destroy that of the other. To this rule, if at times there are apparently some exceptions, the present case is not one of them.

The decree of the court below is reversed, the bill is reinstated and the record remitted, with directions that an injunction be issued perpetually enjoining the Jones & Laughlin Steel Company, the appellee, from such operation of its furnaces, situated in the Fourteenth ward, city of Pittsburg, and described in the bill, as to cause to be emitted therefrom clouds of ore dust, working and causing the injury to the property of the appellants as in the bill described and found by the court below; the costs on this appeal and in the proceedings below to be paid by the appellee.

The dissenting opinion said, in part: The blast furnaces of the appellee company represent a cash investment of $5,000,000, and in them and incidental thereto are employed 10,800 persons, who are paid in wages monthly $500,000. Thus upon the one side is a business started many years ago which has been steadily developing until it has reached a very great magnitude. With its increase, its appliances have been improved and its blast furnaces enlarged, and these have been the natural growth of its business. It has managed its business with a due regard as far as practicable for those who lived near the district within which its blast furnaces were located. It has been diligent in the effort to obtain appliances and inventions designed to avoid as much as possible any annoyance that might arise from smoke dust or gases. . . . The facts show the inability of the appellee to use such ores would practically operate as a prohibition of its business, and thus upon one side a decree restraining appellee from such use would so impair its capacity to do business that it would produce disaster affecting a large manufacturing interest involving the welfare of an army of employees and be productive of irreparable injury.—Sullivans v. Jones & Laughlin Steel Company (reported by Cleveland *Iron Trade Review*); Supreme Court of Pennsylvania, March term, 1904.

PATENTS RELATING TO MINING AND METALLURGY.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending March 29, 1904.

755,606. CONVEYER SYSTEM.—Charles Berghoefer, Chicago, Ill. In a conveyer system, in combination, an endless traction-track, one portion of which is movable relatively to other portions thereof; and a cable-circuit on said traction-track.

755,629. PROCESS OF ANNEALING STEEL.—Leonard D. Davis, Erie, Pa.—A process of annealing steel which consists in immersing steel in a bath of molten metal which fuses between 1,000° and 1,500° F. and gradually cooling steel.

755,653. MATCH COMPOSITION.—Frederick E. Grimm, Utica, N. Y. A match composition, consisting of glue, oxide of zinc, ground glass, gum-benzoin, amorphous phosphorus, sulphur flours, hyposulphite of lead and chlorate of potassium.

755,674. MACHINE FOR MANUFACTURING PEAT INTO BLOCKS FOR FUEL.—Robert A. Kellond and John C. Morrison, Chicago, Ill. In a machine for manufacturing peat fuel, the combination with means—maintained in a cool condition—for compressing the raw material into a succession of blocks or briquettes one upon another, of means—maintained at a higher temperature—for imparting to the entire surfaces of such blocks or briquettes after the formation thereof a coating, envelop, or crust or carbonaceous and tarry or oily natural constituents of the peat.

755,681. HOISTING AND CONVEYING APPARATUS.—Timothy Long, Cleveland, Ohio. A vertical elevator, consisting of a hollow beam, a swiveled pulley on the top of said beam, and a pivoted extension on its lower end, a cable supporting said beam by suspension, said cable running over pulleys on the elevator-carriage frame, and having a counterbalance-weight; a bucketed elevator supported and operated in said beam, and a motor mounted on the beam for operating the elevator.

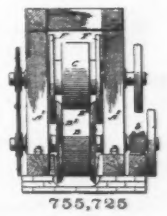
755,686. STAMPING APPARATUS FOR CRUSHING ORES, ETC.—Donald B. Morison, Hartepool, England. Stamping apparatus comprising a gravity-stamp, lifting means for same, including a cylinder, a liquid-cushioned piston and an air-chamber, closed except for free connection with the liquid cushion.

755,690. CENTRIFUGAL PUMP.—Gordon McKay, Newport, R. I., and William O. Hildreth, Lawrence, Mass. In a centrifugal pump, a scroll-casing, a rotary runner therein, said runner having a series of impelling blades, an inlet to said casing, situated in the axial line of said runner, and means to give the fluid prior to its encountering said impelling-blades a motion approximately tangential to the direction of motion of said blades.

755,702. GAS-PRODUCER.—James G. Sanderson, Scranton, Pa. A gas-producer comprising a fuel-chamber having a continuous wall formed of a series of circumferentially-arranged individual water-tubes located in direct contact with each other and provided with passages for the ingress and egress of water therefrom, and bands encircling and impinging against the wall for holding the tubes in place.

755,722. PROCESS OF MAKING METAL CASTINGS.—George Stroh, Syracuse, N. Y. A process of making metal castings consisting in introducing under the molten metal to be cast, a fluent or semi-fluent material of greater specific gravity and applying to the said introduced material artificial pressure sufficient to force the overlying molten metal into the mold or matrix.

755,725. ORE CRUSHING MILL.—Ezra A. Wall, Salt Lake City, Utah. The combination with a frame and a lower roll mounted in fixed bearings therein, of an upper driven crushing-roll having



755,725

free vertical movement toward and from the upper side of the lower roll, to crush the material passing between the rolls, and an independent driving means for rotating the upper roll in an opposite direction to the lower roll and at the same rate of speed.

755,760. APPARATUS FOR DISTILLING PETROLEUM.—Louis Gathmann, Washington, D. C. In a distilling apparatus, the combination of a liquid-heating means; a vaporizer in communication therewith; a condenser communicating therewith; means favoring the radiation of heat from the top walls only of said condenser; and means for drawing off fractions of the condensate along the course of said condenser.

755,763. PROCESS OF TEMPERING OR HARDENING CAST-IRON.—William Gilmour and Alexander Lindsay, Montreal, Canada, assignors of one-half to Charles Augustus Myers and Herbert Henry

Bradfield, Morrisburg, Canada. A process of hardening or tempering cast-iron which consists in heating the metal; then dipping it in a bath consisting of a practically anhydrous acid of high heat conducting and absorbing quality in which is dissolved a heavy metal.

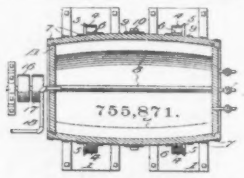
755,818. BRICK-MAKING MACHINE.—John H. Venables, Toronto, Canada, assignor to William J. McMutry, Toronto, Ontario, Canada. In a machine for making bricks the combination of a main frame having a rigid table-surface, a main shaft journaled therein, eccentrics mounted on the main shaft, eccentric-straps encircling the eccentrics, guide-rods for the main frame, a reciprocating cross-head having compressing-plungers movable on the guide-rods, connecting-rods for the eccentric-straps extending through the cross-head and having supporting shoulders to engage its under side, adjustable nuts fitted to the free ends of the connecting-rods, cushioning-springs encircling the connecting-rods and bearing against the cross-head and nuts, a plunger-guide stationarily connected to the main frame above the rigid table-surface, a movable mold-box arranged to be supported upon the rigid table-surface beneath the guide during the descent of the cross-head and plungers, and two conveyer-belts arranged to respectively deliver the movable mold-box with its contents to be compressed in front of the guide and carry it away therefrom when its contents have been pressed into shape.

755,826. WELDING COMPOUND.—Robert S. Woodson, Boulder, Colo. A welding compound consisting of borax from 3 to 6.67 per cent by weight and silicon dioxide from 97 to 93.33 per cent by weight, the ingredients being in pulverized form and thoroughly intermingled.

755,842. APPARATUS FOR CASTING METALS IN VACUUMS.—Walter B. Burrow, Norfolk, Va. A vacuum casting apparatus, the combination of a metallic outer drag, box or case, a flange or lip projecting outward forming a flared rim at the top of the said drag, a detachable cope, bonnet or top over and entirely enclosing the mold in its flask or box, the said outer cope or top fitting into a space on a sand filling around and between the inner mold-flask and the outer drag or box, and a metallic seal at the junction of the outer cope or top and the outer drag or box, of a lower melting-point than the said top part or cope and the lower part or drag.

755,867. METALLURGICAL APPARATUS.—George W. Gesner, New York, N. Y., assignor to Harleston Corbett Gesner, Brooklyn, N. Y. In apparatus for manufacturing hydrogen alloy, a furnace, a large flue leading therefrom, an upright retort mounted concentrically in such flue, and a coil of pipe embedded in the material of such retort, with provisions for passing steam through such coil into the retort.

755,871. APPARATUS FOR TREATING ORE.—Thomas A. Helm, Salt Lake City, Utah. An apparatus for treating pulverized auriferous ores,



comprising a rotatable cylindrical tank, radially-depending blades in the tank extending the length thereof, a circular brace-frame disposed between the inner ends of the radial blades, an air-pipe leading into the tank, faucets to draw off a liquid from the tank, and means to rotate the tank.

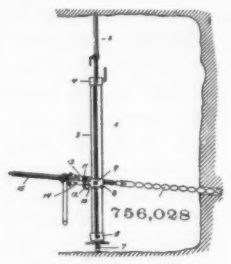
755,912. CLAM-SHELL BUCKET.—Will K. Monroe, Cleveland, Ohio. The combination with a bucket comprising two oppositely-disposed scoops, of a frame having power-transmission mechanism mounted therein, swinging arms depending from said frame and supporting the outer ends of said scoops, lever-arms rotatably supported at their lower ends near the bottom of said frame, suitable supporting arms of said scoops hinged respectively to the upper ends of said lever-arms, and suitable means for opening and closing said bucket.

755,947. CEMENT-FURNACE.—Jackson Sheneman, Bronson, Mich. The combination with an internally-heated revoluble kiln, of drying-troughs arranged above the kiln, and separated therefrom by an air-space, said troughs being heated by radiation from the kiln, and means for conveying the material to be dried lengthwise of said troughs.

755,951. PROCESS OF TREATING ORES.—Joseph Smith, San Francisco, Cal. In the cyanide treatment of ores, the method of rendering insoluble in the cyanide solution, ferrous oxid contained in a mass of moist crushed ore, which method consists in applying heat to said mass in the presence of air, previous to its treatment by the cyanide solution.

755,956. METHOD OF CONSTRUCTING TUNNELS, SHAFTS, OR OTHER EXCAVATIONS.—Charles Sooysmith, New York, N. Y. A method of tunnelling which consists in constructing a freezing-chamber in the material to be excavated, freezing the surrounding material, advancing a shield in rear of the freezing-chamber, and completing the tunnel-lining.

756,028. COAL AND ROCK DRILLING MACHINE.—Louis K. Koontz, Allegheny, Pa., assignor to Martin Hardscog Manufacturing Company, Limited, Allegheny, Pa. Supporting means for



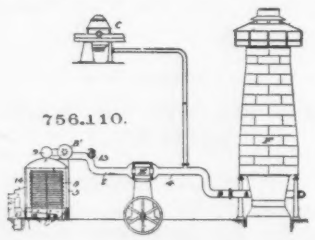
drilling mechanism comprising a vertically-reversible support, and drilling-mechanism-sustaining means thereon having upwardly and downwardly disposed hook-shaped supporting-points.

756,059. GAS-RETORT CHARGER.—John Saltar, Jr., Philadelphia, Pa. In a gas-retort charger, the combination with a retort having a mouth surrounded by a seat; of a charging vessel constructed to oscillate to deliver fuel to the retort, and means arranged to vary the pressure upon said vessel to alternately seal the retort-mouth and permit the movement of said vessel.

756,080. BRAZING COMPOUND.—Joseph E. Tichon, New Bedford, Mass., assignor to Theodore E. Parker, New Bedford, Mass., and Henry F. Strout and J. Colby Bassett, Boston, Mass., trustees. A brazing compound containing boro-boracic acid and particles of metal.

756,093. FILE OR CARRIER FOR MINERS' PICK-BLADES OR LIKE TOOLS.—John Beeton and James Wardall, Hucknall, Torkard, England. A file or carrier for miners' pick-blades (and other like tools) consisting of a body provided at one end with a handle and at the other end with a base-plate, the said body being formed with tenons or dovetails down and into which the pick-blades (having the usual recess) are adapted to slide and engage, and means for locking the said blades in place.

756,110. METHOD OF EXTRACTING MOISTURE FROM AIR FOR BLAST-FURNACES AND CONVERTERS.—James Gayley, New York, N. Y. A method of feeding the air-blast to blast-furnaces or converters, which consists in cooling the air artificially, thereby causing its moisture to



be reduced to a small percentage, feeding the dried air to a blowing-engine by initial pressure of relatively small degree sufficient to overcome in whole or in part the friction of the air-current in the apparatus, increasing its pressure at the blowing-engine to a degree above that to which it was initially subjected and feeding the dried air therefrom under compression into the furnace or converter, and maintaining it under compression from the time it leaves the blowing-engine until it enters the furnace or converter.

756,124. METHOD OF PRODUCING PIT-COAL OR COKE BRIQUETTES.—Johann Lieb, Cologne, Germany. A process of producing briquettes of fuel consisting in mixing a small quantity of resin or equivalent agglutinant with fine coal; then moistening the mixture with water to the consistency of a mass suitable for molding; then shaping the briquettes and finally subjecting them to such heat as will greatly soften the resin, vaporize the water and cause the steam thus produced to carry the particles of resin into every part of the briquette.

756,129. METHOD OF TREATING PEAT IMMEDIATELY PRIOR TO COMPRESSION.—William A. Milne, Brown's Corners, Canada. A method of treating peat immediately prior to compressing consisting in passing pulverized peat through a heated zone and during such passage introducing moisture into the stream of pulverized peat and then compressing the peat.

756,130. TEMPERATURE AND MOISTURE REGULATING APPARATUS.—William A. Milne, Brown's Corners, Canada. In a temperature and moisture regulating apparatus for peat prior to compressing, the combination with the drier and compressor, of a conveyer extending from drier to compressor, and heating means inclosing the conveyer throughout its length for keeping the heat in the peat until it reaches the compressor.

756,151. MINER'S LAMP.—John Anton, Monongahela, Pa. A miner's lamp consisting of a body the base of which is formed with an outwardly-bulged flange, the inner termination of which lies in a plane transverse to the flange, and a bottom supported against downward movement by said flange and against upward movement by frictional contact of its periphery with the interior of the flange.

756,170. CONVEYER SYSTEM.—Daniel A. Keating, Bridgeport, Conn., assignor of one-half to Clarence D. S. Miller, Bridgeport, Conn. In a system of the character described the combination with a car having a pulley, a pulley on a fixture and a sliding block having a pulley at each end, of a rope connected to the car and extending over pulley, then backward past the car and over the pulley at the forward end of the sliding block and then forward and downward over the pulley on the car, the free end thereof being adapted to receive a weight, and an operating-rope connected to a fixture and extending over the pulley at the rear end of the sliding block whereby the car may be moved in either direction, a rope passing freely over the pulley and a pulley at the forward end of the sliding block, but remaining stationary relative to the pulley on the car and the weight remaining stationary.

759,189. ARTIFICIAL FUEL AND PROCESS OF PRODUCING SAME.—William B. Thomas, Towns, Ga. A process of producing an artificial fuel from the residuum known as rosin-batting, which consists in pulverizing the rosin-batting, then mixing it with some less inflammable but combustible material, as some woody refuse or fiber, then heating and molding in any desired order.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week Ending March 12, 1904.

24,417 of 1902. CYANIDE FILTER.—C. H. Webb, Dorking. Improved form of vat for filtering the cyanide solution carrying the gold from the gangue.

7,979 of 1903. ROCK-DRILL.—W. C. Stephens, Camborne. Improvements in the inventor's percussive rock-drills, relating to the valve for distributing the air pressure.

9,268 of 1903. SPRAY PUMP.—F. Herbert and P. Kirkup, Bertley. Spray pumps operated from the axle of a water tank wagon for laying dust in mines.

9,346 of 1903. STEEL MAKING.—C. J. L. Otto, Dresden, Germany. Producing steel direct, in a crucible, by acting on iron ores mixed with scrap, with a hot-air blast, the metal being out of contact with the reducing fuel.

9,455 and 9,455A of 1903. BUCKET ELEVATOR.—G. Dalton, Leeds. Improved bucket elevators for use in connection with rock breakers, screens, etc.

21,893 of 1903. MINE CAGE CLAMP.—H. Hewitt, Atherstone. Improved clamps for supporting mine cages on the guide-ropes on the breakage of the winding rope.

26,037 of 1903. TUYERE.—E. Bertrand and E. Vorbach, Kladno, Bohemia. Improved nozzle for tuyeres of blast furnaces, which can regulate to a nicety the amount of air passing in.

SPECIAL CORRESPONDENCE.

Butte. **Mar. 30.**

(From Our Special Correspondent.)

The United States Court at Butte is hearing the contempt cases against the Montana Ore Purchasing Co., F. Aug. Heinze, J. H. Trerise and Alfred Frank, who are accused of violating certain orders of this court issued in 1898. The first hearing was that in which the defendants were enjoined from working the veins of ore within the lines of the Michael Davitt claim. The original injunction was obtained by E. Rollins Morse, of Boston, acting for the Butte & Boston Mining Co. The plaintiffs claim that by secret drifts and cross-cuts from the Rarus shaft, operated by the defendants, large tonnages of ore have been extracted from the enjoined ground, aggregating in gross value $1,200,000 or more. The hearing is taking place before Judge Beatty, of the Federal Court of the Idaho district. The defendants admit that the mining complained of has taken place as alleged, but that it was done by the Johnston Mining Co., a supposed auxiliary of Heinze, and operating through the Rarus shaft, this latter being a Montana Ore Purchasing Co. or Heinze property. The defendants further claimed that the injunction did not hold as against the Johnston Mining Company.

A second case, now before the court, is that wherein the Boston & Montana charge the Montana Ore Purchasing Co. with violation of an order obtained from Federal Judge De Haven in 1898 enjoining the defendants from crossing the west end lines of the Rarus and mining in ground within the lines of the Johnston claim and owned by the plaintiff company. This the defendants are accused of doing. This, it is admitted by the defendants, was done, but not by them jointly, but by J. H. Trerise as superintendent of the Montana Ore Purchasing Co. A truce of underground hostilities has finally been arranged between the Boston & Montana people and the Heinze forces, each side agreeing to respect a neutral zone pending judicial adjudication of ownership. This agreement was brought about over a discharge of water from the Minnie Healey mine into the Leonard mine workings. The Boston & Montana people, who are operating the Leonard, have experienced considerable trouble lately from an excessive flow of water, claimed by them to have been purposely turned into the Leonard by the Heinze forces from the Minnie Healey upper workings through a hose and otherwise. The shaft of the latter mine is located so that one corner is slightly over the side line of the Leonard. The Leonard people picked up the water, and, by breaking through into the Healey shaft, lower down, turned the water back, where it drowned out the lower workings.

Judge Clancy, last October, granted the Minnie Healey people an injunction against the Leonard from mining certain veins in the latter ground, but the Supreme Court modification leaves a strip 145 ft. wide next to the Minnie Healey side line free from any restrictions; this lies north of the Minnie. The latter have run across this strip into the Leonard workings. The water complained of by the Leonard is said to have come from this new cross-cut.

F. Augustus Heinze, A. L. Frank, superintendent of the Johnstown Mining Co., and J. H. Trerise, superintendent of the Rarus mine, were found guilty of contempt of court on March 30. Heinze was fined $20,000, while Frank and Trerise were fined $1,000 each. The fines were held subject to further orders of the court and the final decision of the litigation.

Permission for inspection of the workings of the properties in dispute was granted.

San Francisco. **Mar. 30.**

(From Our Special Correspondent.)

The Kate Hayes decision is still discussed among the miners of California. It may be remembered that the State Supreme Court decided against the mining company, which was ground-sluicing and not hydraulicking, and concluded that the operation so conducted constituted a public nuisance. The main point of the decision is contained in the following sentence: "It is true that the evidence failed to show that defendants were mining by hydraulic process, but admittedly they were mining by the ground-sluice process, which, according to the evidence, produced the same effect in kind as the hydraulic process, only to a less degree." At the time this decision was rendered the ENGINEERING AND MINING JOURNAL made editorial comment to the effect that the ground-sluice miners were practically now brought into the same class as hydraulic miners, so far as the chance of being enjoined for damaging lands was concerned, though there is no law against ground-sluicing, while there is one against hydraulicking. Moreover, the JOURNAL contended that the decision was rather far reaching, and that the principle might be applied to quartz mining where much tailings were passed into a stream.

Judge Belcher, of San Francisco, replied to the article, contending that the view presented was rather pessimistic and that the decision did not at all broaden the original decision against hydraulic mining in the famous North Bloomfield case. He said it was a question of "material" damage only, and that the word "material" would restrict and limit the decision in particular cases where injunctions were asked against ground-sluice miners. In other words, where only small quantities of earth or gravel were disturbed as in an ordinary ground-sluice operation, men could not be stopped in their work. In the Kate Hayes case immense quantities of water were used, creating large quantities of debris. He did not think the decision as far reaching and important as the JOURNAL had stated.

In view of the importance of this decision to the mining industry of the State the California Miners' Association had it printed in full and sent to owners, managers and superintendents of all producing and prominent mines in all the counties. With the copy of the decision there was sent a circular asking the opinions of those addressed as to its probable influence on mining affairs and the effect it might have upon the quartz, drift, and river dredge mining operations throughout the State.

Mr. E. H. Benjamin, the secretary of the Miners' Association, has already received some 200 replies from the most prominent mining men in the State, and with only a single exception they consider the decision a damaging blow to the mining industry of the State. Many thought it would undoubtedly be used by the Superior courts in anti-mining or "cow counties" as a stepping stone on which to base all decisions in mining cases brought before them, independent of the difference in methods of gravel mining. Most were of opinion that the law would require little stretching to be applied to quartz and drift mines, or in fact to any branch of the gold mining industry. Most California gold mines discharge tailings of some kind into tributaries of streams passing through agricultural sections. It is, therefore, impossible to operate these mines without doing some little damage. If this in itself constitutes a public nuisance, and the mine is enjoined, or closed, without regard to the relative value of properties in question, the decision is dangerous not only to the mining interests, but to the welfare of the entire State. Very few of the mines attacked under this decree can afford to impound tailings.

The consensus of opinion thus brought out thoroughly endorses and approves the view taken by the JOURNAL, and shows that it holds the same opinion as the mining community generally. If the JOURNAL was mistaken, as Judge Belcher holds, then the miners themselves are mistaken.

Some prominence is given this matter here for the reason that there still exists in certain valley counties of this State a very strong prejudice not only against hydraulic miners, but against all those engaged in mining operations of any kind. This is the result of the old warfare between the mountain and the valley counties. It is true that the Anti-Debris Association has at present official recognition from two counties only, and derives its support from them. But the members are persistent and active, doing all they can to undermine the mining industry of the State. It was through their efforts that Yuba county began the suit against the Kate Hayes Mining Co., which was ground-sluicing gravel, a system in vogue before hydraulic mining was invented or thought of. The miners had no idea that this system of mining could be attacked in any way, but they were mistaken, and the Anti-Debris Association won its point. This association has always desired to stop quartz miners emptying their debris into the streams, and is gradually getting into their domain. It was not satisfied with the hydraulic mining decisions, but has wanted to stop all kind of mining creating debris. The miners now think that having gained the point of bringing ground-sluice miners into the same category as hydraulic miners, the association will keep on until it brings in the drift and quartz miners also. Whatever may be thought of the decision by those who consider the exact legal features only, the fact remains that the miners themselves fear a broadening of kindred decisions which will entangle all classes of gold miners. At all events the ruling is of such a character that no miner creating any debris or tailings can tell how long he will remain immune from injunction or damage suits.

In this connection it may be stated that deputies of the California Debris Commission, in efforts to ascertain the amount of natural erosion now going on in certain water-sheds have been examining particular streams in different sections. The question is one affecting the preservation of navigation of the rivers of the State. One of the deputies last week took samples of the water of Deer creek, in Nevada county, considering it a fair average of the entire Yuba river water-shed. This is a locality where very little hydraulic mining has been carried on for years and none whatever this winter. The creek had cleaned its bed of old mining debris, and only contained a small deposit of gravel, such as any mountain stream would. Yet on one day's examination it was found that the creek carried sand and silt past a given point at the rate of 4,400 cu. yd. during 24 hours, or as much as an ordinary hydraulic mine would send down in a season. It is true that the flow of water was, at the time of record, more than an average. There is found to be a close relation between the volume of silt in Deer creek and the lower reaches of the Yuba river. This subject of natural erosion is one that must receive more attention from the engineers in charge of local river improvement in the next few years. At present all the silt passing is charged to mining operations, and the miner is held responsible for what Nature is doing. The miners have always contended that there was much natural erosion, but the valley people have combatted this assertion very persistently because the miners urged it. Continued plowing, of course, stirs up the ground and gives the rains a chance to carry off the silt, but the miner has always been blamed for the whole damage done. The great barriers to be built in the rivers by the Government and State will to some extent prevent the passing down of much of this material, but they cannot stop it all. Even if miners and farmers both stop work, natural erosion will still continue. Several feet of rain falling in one or two months after a long dry season will wash out millions of cubic yards of silt and send it down the streams to be deposited in still places.

Heavy rains continue in the upper part of the State, seriously affecting mining. In several quartz camps the rains have caused the water to rise, so that numerous miners have had to be laid off. Some big mines are doing nothing but hoisting and pumping water. In others the lower levels have been flooded. In Grass valley district not a day for eight weeks has passed without rain, and many mines have had to close partly or altogether, something unprecedented in the history of the county. At Bully hill, Shasta county, the rains have continued since February 3. In Trinity county, as well as Siskiyou, landslides have damaged several mines, and floods in the streams have caused others to stop work. Nearly all the large ditches have been cut and hydraulic mining has ceased for a time. Many of the electric power plants in different places are temporarily out of business.

Spokane. **Apr. 1.**

(From Our Special Correspondent.)

The Hecla Mining Co. recently declared its quarterly dividend for March of 2c. per share. It is shipping to an independent smelter at Salida, Colo., and not the American Smelting & Refining Co., which formerly controlled its output. The American Smelting & Refining Co. is

not getting as large a proportion of Coeur d'Alene ores as formerly. The Hercules owners are allied with the Selby smelter at San Francisco. The Coeur d'Alene Development Co. is now producing only a little ore under lease. The Federal Co. and the Morning are tied up under contracts with the American Smelting & Refining Co., but the Bunker Hill & Sullivan is shipping to the Tacoma smelter.

The Kendall Mining Co., controlled by the Finch & Campbell interests, which operates the Kendall gold mine in Fergus county, Mont., has paid its March dividend of 5c. a share, or $25,000.

A carload of ore has been shipped from the Coeur d'Alene district by the Idaho World's Fair committee to St. Louis. The largest piece is a block of galena weighing four tons from the No. 6 tunnel of the Mammoth. Other mines sending exhibits are the Bunker Hill & Sullivan, the Hecla, the Tiger-Poorman, the Last Chance and the Morning. The management of the Hercules declined to make a display.

The Eureka-Pacific Placer Mining Co. has secured patents to its claims in Pierce City, Idaho. The claims extended for nearly 10 miles and in some places were not more than 50 ft. wide. The interior department has hitherto held that locations must conform as nearly as possible to the United States system of public land surveys, and the commissioners of the general land office cancelled the entry because of this. The company appealed to the Secretary of the Interior, who has allowed the claims to pass to patent because they are essentially gulch claims, and at the time the interior department permitted such locations.

Larson & Greenough, owners of the Morning mine, who lately bonded the old Franklin mine at Pine, north of Mountain Home, Idaho, are reported to have struck the ledge 200 ft. below the former adit.

The tangled affairs of the Lucille Dreyfus Mining Co. are getting more complicated. H. S. Willard, a Wellston, O., banker, has a block of shares of fraudulent stock, which he claims were issued to him by Kressley. He is planning a settlement, whereby the capital of the company will be increased from 1,000,000 to 1,400,000 shares—four shares of the new capital to be issued to each holder of 10 shares of the bogus stock. Some local shareholders are bitterly fighting this plan. Mr. Willard has secured an injunction in the Superior Court restraining the company from holding any elections until the title to disputed stock is fixed. The opposing faction, headed by J. Hy. Thierman, has appealed to the Supreme Court to set the injunction aside.

Victoria. Mar. 29.

(*From Our Special Correspondent.*)

Arrangements are being made for the establishment of a branch of the Owen Sound Cement Works, of Ontario, at Saanich Arm, Vancouver Island. It is said that cement can be manufactured and sold profitably at about half the price of the imported cement.

It is announced that operations will be resumed early in April at the Nettie L. and Silver Cup mines, near Ferguson, the new combination silver mill being now practically completed. Development work is proceeding steadily at several claims in the Poplar creek section. Pumping and other machinery have been purchased for the Handy company's mine.

The silver-lead mine owners, at a meeting in Sandon last week discussed the situation and adopted the resolution asking the Dominion Government to extend the benefits of the bounty act to a limited amount of ore exported and smelted abroad.

Mr. Claudet, manager of the Elmore company at Rossland, is reported to have said that the cost of concentration by oil in that camp should before long not exceed $1.25 per ton. He also announced that the Elmore company had received an order for a 100-ton plant for the White Bear mine.

At the Emma mine, in the Boundary district, a shoot of high grade copper ore is reported in the new tunnel. The Emma ore has been shipped to the Nelson smelter and used as a flux. Ore from the Providence, one of the many high grade mines near Greenwood, is now being sent to the Trail smelter without sorting.

The new machinery for the St. Eugene mine, at Moyie, East Kootenay, is being installed, and it is thought mining will shortly start.

San Luis Potosi. Mar. 29.

(*From Our Special Correspondent.*)

The wild-cat schemes in El Oro and Tlalpujahua, that were started on the strength of the showing made by the Dos Estrellas and Esperanza, have had an ill effect apparently upon almost all mining in the southern part of the republic, where a general dullness prevails.

In Chihuahua it is understood that the Pan-American Smelting & Refining Co. has purchased from Stallforth & Co., through Grant G. Gillett, the Quebradillas, of Minas Nuevas, for $750,000 gold, that new machinery and pumps will be put in, and the output increased to 100 tons a day. At San Jose del Citio, about 90 miles southwest from Chihuahua, a company of Pittsburg men are putting up a 40-stamp mill. A railroad, known as the Grand Mineral Railroad, is to connect with the Southern Pacific at Denning, Ariz., and about 30 miles are built.

In Coahuila an American company is negotiating for the salt beds of Saco, 60 miles northwest from Jimenez, and owned by people in Glasgow, Scotland. If the deal goes through the new owner will put in a railroad to connect with the Mexican Central.

In Durango the American-Mexican Mining & Development Co., of Chicago, Torreon and Velardeña, is planning a 1,000-ton smelting plant at Torreon. A contract has been let to the General Electric Co. for a $50,000 electric power plant for the company's mines at Velardeña. A large American company is said to be negotiating for the Somera, at Guanacevi, for $5,000,000, Mexican, and another American company is making an examination of the old Pilones mines. A London company has M. J. Carey examining a recent rich discovery in the northern part of the State. The various interests in the Vacas and San Marcos properties, near La Parilla, Durango, which have been in the courts more or less for the last ten years, have been brought together by B. Clark Wheeler, formerly of Aspen, Colo., and sold to a New York company, organized with a capital of $3,000,000, Mexican money, as the Vacas-San Marcos Mining & Milling Co. The properties are working and a contract has been made with the Mexican Metallurgical Co., through R. S. Towne, its president, to ship all concentrates running over 40% lead to the San Luis Potosi smelter.

In Michoacan, A. J. Peyton & Co. are opening the Santa Emilia, Dona Luisa and Natividad, comprising over 400 pertinencias, about 35 miles south of Coapa station of the Mexican National Railroad. On the Santa Emilia a shaft is down 600 ft., which is said to have cut two good veins of red oxide of copper, while the Dona Louisa has three tunnels, all said to show good copper ore.

The Santa Fé Mining Co., of Oaxaca, is a new company, organized with $250,000, Mexican capital, to work some 40 pertinencias, near the city of Oaxaca, under the management of Arthur Williams. In the State of Chiapas, the Chiapas Mining Co., Ltd., is doing much new development under the direction of William Frecheville, of London, the company's consulting engineer.

London. Mar. 26.

(*From Our Special Correspondent.*)

The West African mining market has sustained a severe blow by the death of Mr. Frederick Gordon, which took place suddenly this week. Mr. Gordon was best known to Americans as the founder of many of the great modern hotels in London and elsewhere, and also as the business man who arranged the details of the consolidation of Guest Keen and Nettlefolds. Many people were surprised when he left the industrial market and embarked in speculation in West Africa; but he obtained a large and influential following and his company, the Ashanti Goldfields Corporation has obtained better results than any other. From a market point of view, the company was extremely successful, for many of the treasury £1 shares were issued at £10, and in the market the quotation reached as high a figure as £32. As the nominal value of the issued capital was £155,000, the confidence with which speculators regarded the future may be easily imagined. The company has paid substantial dividends and has a large plant in operation. Though Mr. Gordon knew nothing of mining, when he embarked on the speculation his general business ability was so great that he soon obtained an intelligent grasp of the subject, and the results justified the position he obtained in the market. This particular company, as well as the market generally, will suffer considerably by his death. Very little has been heard of West Africans just lately and a number of the mines are being abandoned.

The report of the United Alkali Co. for 1903 shows that the company is still overweighted with capital. Although a profit of over £330,000 was made, the ordinary shares receive no dividend, as has been the case for many years past. The debenture interest absorbed £128,000, and the preference dividend £187,000, so that there was nothing left for the £3,000,000 of ordinary shares. As I have pointed out in previous years, this inability to earn an ordinary dividend is not any sign of mismanagement. The directorate contains the names of many men eminent in the chemical industry of Great Britain, and the raw materials and by-products of the various works are such as conduce to the greatest economy. The fact is that the original capitalization was made far too high. The purchase price of the various works contained far too much good will. In those days, hostile tariffs had not cut down profits and foreign products were not being "dumped." To those who follow the advance in the chemical manufactures of the United States and other countries outside Britain, it is obvious that the United Alkali Co. will never make the profits with which it started, so that it would only be logical to reorganize the capital of the company on a basis more in conformity with present conditions. It is noteworthy that the company complains of the low price of chlorine products, bleach and chlorates. All the English companies have suffered in this way, through the action of the German makers in selling their products for anything they can get irrespective of cost. There seems no likelihood of any immediate renewal of the bleach agreement in spite of much negotiation that has gone on recently.

Auckland. Mar. 5.

(*From Our Special Correspondent.*)

The Thames section of the Hauraki goldfield still languishes. The very moderate gold returns are due to the exertions of a handful of tributers. During the past three months little or no progress has been made in deep boring, owing to the difficulties met in the two holes under way. In the Kuranui-Caledonian borehole a depth of over 1,000 ft. was reached, when the rods broke, while being withdrawn, and all efforts to recover the bit have proved unsuccessful. The Victoria Co.'s borehole has not yet reached a depth of 500 ft., although boring has been proceeding for nearly three months.

Dredging.—During the past few weeks most of the Otago dredges have been obtaining extremely good returns, the Molyneux river being lower than usual for this time of year. Speculation in the share-market, however, is almost absent. If, as is probable, the river is low the coming winter, 1904 will be a record year in the history of New Zealand dredging.

Hauraki Goldfield.—The Waihi Co. maintains its position as one of the world's greatest gold producers, the last monthly return being £50,259 ($251,295) from 19,630 tons, equal to £2 11s. 2d. ($12.45) per ton. The adjoining mine, the Waihi Grand Junction, is not yet a bullion producer, but recent developments indicate that it may yet rival the Waihi. A very complete 40-stamp battery purchased from the moribund Kauri Freeholds Co., is being removed from Opitonui to Waihi. By the end of the year it is expected that the battery will be at work for the Grand Junction Company.

TO ENGINEERS VISITING NEW YORK.

A room for the exclusive use of visiting mining engineers is maintained at the New York office of the ENGINEERING AND MINING JOURNAL. Visitors to the metropolis are cordially invited to take advantage of the facilities it offers, by having their mail addressed in care of the JOURNAL, and making this office their headquarters. The managers of the branch offices will also be glad to welcome visiting engineers and to be of any service to them that they can.

TO ENGINEERS VISITING LONDON.

We are informed that the Institution of Mining and Metallurgy offers to all members of the American Institute of Mining Engineers nonresident in Great Britain, the privilege of free use of the Institution offices and library in Salisbury House, London Wall, E. C. Visiting engineers may have their letters addressed to the offices of the Institution, and thus enjoy the advantages of temporary office accommodation in the city of London.

PERSONAL.

Mining and metallurgical engineers are invited to keep the Engineering and Mining Journal informed of their movements and appointments.

Mr. Chester W. Purington is at Cripple Creek.

Mr. J. Parke Channing is at Copperhill, Tennessee.

Mr. C. V. Haines is on his way from London to India.

Mr. T. W. Davidson, of Sumpter, Ore., is visiting New York.

Mr. M. S. Stutchbury has returned to London from Russia.

Mr. Thomas Tonge, of Denver, has returned from Parral, Mexico.

Mr. H. W. Turner, of San Francisco, Cal., has gone to Tonopah, Nevada.

Mr. F. W. Bradley is engaged in professional work in Baker county, Oregon.

Mr. Thomas H. Leggett reached New York from San Francisco on April 4.

Mr. Frank Z. Maguire, of Maguire & Bancus, London, has been in New York recently.

Mr. J. H. Curle was at St. Petersburg on March 25. He is expected in London now.

Mr. H. W. Hardinge, of Denver, has gone to Arizona and Mexico on a professional trip.

Mr. Forbes Rickard, of Denver, is examining mining property in Boulder county, Colorado.

Mr. Robert T. Hill is the first president of the Pelée Club, recently organized in New York.

Dr. R. W. Raymond, of New York, has returned from the excursion to Cuba and Porto Rico.

Mr. J. C. Erman has become manager of the Tri-Bullion Smelting & Development Co., of Chicago.

Mr. Fred D. Smith, of the Snow Creek mine, near Greenhorn, Ore., has returned from New York city.

Mr. N. Harper has resigned as manager of the White Feather Main Reef mine, in Western Australia.

Mr. William A. Pomeroy is manager of the Great Fingall Consolidated mine at Cue, Western Australia.

Mr. C. H. Glasser has been appointed consulting mechanical engineer to the Tennessee Copper Company.

Mr. Vaughan Rhys, who has been directing work at the Van Anda mines, Texada Island, B. C., has resigned.

Mr. Edgar Rickard has been at San Francisco on a visit from Lower California. He sailed on March 29.

Mr. William E. Gibbs, of New York, is one of the lecturers to the Carnegie Technical School at Pittsburg.

Mr. A. A. Steel, of the Engineering Co. of America, has gone to the Black Hills, S. D., to examine a gold mine.

Mr. G. M. Gouyard, of Denver, has gone to Sonora, Mexico, on professional work which will occupy one month.

Mr. Frank Klepetko has removed his offices from the Maritime building to the Battery Park building, New York city.

Mr. C. A. Bohn is now night metallurgist at the plant of the American Smelting & Refining Co., at Monterey, Mexico.

Mr. W. Evan Simpson has been appointed manager of the Oroya-Brownhill mine, at Kalgoorlie, Western Australia.

Mr. F. W. Hoar, general manager of the Old Dominion mine, recently resigned and is succeeded by Mr. L. D. Ricketts.

Mr. H. Oren Cummins has been appointed general manager of the Middie Creek Gold Mining Co., of Shasta, California.

Mr. George I. Adams, of the United States Geological Survey, is going to Peru to organize a service for hydrographic work.

Sir William John Menzies, of Edinburgh, Scotland, president of the Arizona Copper Co., was at Phoenix, Ariz., recently.

Mr. Irving A. Chandler, of the Engineering Co. of America, has gone to Kentucky to report on certain proposed electric railroads.

Mr. Ferdinand Ruttman has resigned the general superintendency of the Vacas-San Marcos Mining Co., of Mexico and New York.

Mr. J. T. Hollow has been compelled by ill health to resign his position as manager of the Oroya-Brownhill mine, at Kalgoorlie.

Mr. Robt. J. Montgomery is now New York sales agent of the Philadelphia & Reading Coal & Iron Co., succeeding Mr. John Edmonds.

Mr. A. B. Frenzel returned from Europe by the *Cretic*, reaching Boston on March 26. He is now in New York, and will proceed shortly to Denver.

Mr. Robert M. Bird, succeeds Mr. R. C. Drinker as superintendent of the testing department of the Bethlehem Steel Co. of South Bethlehem, Pennsylvania.

Mr. R. J. Grant, of Denver, has accepted a position with Bewick, Moreing & Co., at Kalgoorlie. He sails from San Francisco for Western Australia on April 14.

Mr. Samuel Brady, superintendent of the Michigan mine, is also manager of the Adventure Consolidated property in Ontonagon county, Mich., from April 1.

Mr. Robert H. Richards, professor of mining and metallurgy at the Institute of Technology, Boston, will lecture before the Carnegie Technical School at Pittsburg.

Mr. J. R. Finlay, who is now connected with the mining department of the Guggenheim Exploration Co., is at present at the mines of the Federal Lead Co., in Missouri.

Mr. John C. Treadwell, lately superintendent of the Sahuayacan Mining Co., has been appointed manager in succession to Mr. Leo Reed, who returns to Pittsburg.

Mr. Harry Huntington Miller, of New York, has left for the Pacific coast and Mexico on professional business in connection with the Balsas Valley Co., of which he is general manager.

Mr. Samuel Sanford, associate editor of THE ENGINEERING AND MINING JOURNAL, delivered an address before the Harvard Mining Club, at Cambridge, Mass., on the evening of Friday, April 1.

Mr. L. V. Pirsson, professor of physical geology, has been chosen to fill temporarily the curatorship of the geological collection of the Peabody Museum, Yale University, made vacant by the death of Prof. C. E. Beecher.

Dr. Joseph Struthers, assistant editor of the American Institute of Mining Engineers, gave a lecture on 'The Cyanide Process for the Extraction of Gold and Silver' to the classes in metallurgy of Columbia University School of Mines on March 28.

Mr. John Edmonds, who was in the employ of the Philadelphia & Reading Coal & Iron Co. for 27 years and from 1893 New York sales agent of the company, is now general manager of the anthracite coal business of Madeira Hill & Co., of New York, and George B. Newton & Co., of Philadelphia.

Dr. William O. Emery has been appointed head of the chemical department and director of the chemical laboratories in the New Mexico State School of Mines. He was connected with the University of Chicago and was professor in Wabash College. He has done much work in technical chemistry and has made inquiries into the content of mine waters.

Mr. Frank J. Pratt this week retires from his position as treasurer of the ENGINEERING AND MINING JOURNAL to engage in other business. Mr. Pratt has been connected with the JOURNAL for 24 years and has been treasurer for a number of years past, holding the position under all the different administrations. He was executor of the estate of the late Richard P. Rothwell and negotiated the sale of the JOURNAL by the estate after Mr. Rothwell's death. Mr. Pratt carries with him in his retirement the esteem and confidence of everyone connected with the JOURNAL and also of its many friends and constituents to whom he was known personally and through his business relations.

SOCIETIES AND TECHNICAL SCHOOLS.

UNIVERSITY OF CHICAGO.—The students in economic geology at University of Chicago and Northwestern University, visited the zinc smelters, coal mines and cement plants near La Salle, Ill., March 18 and 19.

NORTH PACIFIC SOCIETY OF MINING ENGINEERS.—At a well-attended meeting on March 24, at Seattle, Wash., this organization took definite shape. A constitution and by-laws were adopted and officers were elected. The qualifications of members were definitely fixed and members will be professional mining engineers, geologists, metallurgists or chemists, or persons professionally engaged in mining, metallurgy or metallurgical engineering. The society's affairs are to be managed by a board of five persons who are the officers. Those elected to serve for the first year are: President, Chester F. Lee; vice-president, Milnor Roberts; recording secretary, F. C. Newton; corresponding secretary, P. C. Stoess; treasurer, C. E. Bogardus. It is the intention of the society to present papers and have discussions on matters of mining practice, to have addresses and informal talks from prominent geologists, mining engineers and other specialists.

COLORADO SCHOOL OF MINES.—The exhibit of the Colorado School of Mines of Golden, Colorado, will be a working assay and metallurgical laboratory. A space of 25 by 50 ft. has been assigned in the metal pavilion, directly opposite the Mines and Metallurgy building. The equipment will consist of one coal and two gasoline furnaces, and the necessary accessories, four desks for chemical work and a dust proof balance room enclosed in glass. The Denver Fire Clay Co. will furnish the coal furnace and the necessary equipment for assaying and metallurgical work. Wm. Hoskins, of Chicago, and F. W. Braun, of Los Angeles, will supply the gasoline furnaces. Ainsworth & Sons have agreed to equip the exhibit with balances, and the Colorado Portland Cement Co. will provide an ornamental archway and a mosaic floor. The work will be done by the students of the Colorado School of Mines, under the direction of a committee of the faculty, consisting of Victor C. Alderson, president; F. W. Traphagen, professor of metallurgy and assaying, and Herman Fleck, professor of chemistry. It is intended to assay free of charge all specimens that visitors may choose to submit. It is believed that this exhibit is the first of its kind ever attempted.

INDUSTRIAL.

The New York offices of the Colorado Iron Works Co., of Denver, will be in the Engineering building, 114 Liberty street, after April 1.

The Power & Mining Machinery Co. of Cudahy, Wis., has installed a 100-ton Holthoff revolving hearth roasting furnace in the Portland mill near Colorado Springs, Colo.

The machine shops of the Pittsburg Valve Foundry & Construction Co., at Pittsburg, were destroyed by fire March 29. The loss, it is reported, will probably reach $200,000.

The F. W. Braun Co., of Los Angeles, Cal., is to have a complete display of laboratory supplies and appliances in the Mines and Metallurgy building at the St. Louis Exposition.

The J. George Leyner Engineering Works Co., of Denver, Colo., is about to call for bids for the construction of a manufacturing plant at Littleton, Colo., to cost about $150,000.

The American Locomotive Co., it is reported, is planning purchases of machine tools said to total $500,000 for the recently acquired plant of the Locomotive & Machine Works of Montreal.

The Denver office of the Allis-Chalmers Co. has contracted with the Cripple Creek, Homestake Mining & Reduction Co., of Cripple Creek, Colo., W. O. Temple, general manager, for the erection of a 1,000-ton cyanide plant, construction on which will start at once.

The Corinth Engine & Boiler Works, Corinth, Miss, organized some months ago, has completed plans for its new plant, which will consist of a foundry, 60 by 150 ft.; a machine shop, 75 by 150 ft.; boiler shop, 75 by 150 ft.; pattern shop, 40 by 75 ft.; warehouse, 40 by 100 ft., and office building, 30 by 60 ft. The buildings will be constructed of brick.

The American Locomotive Co. has obtained a controlling interest in the Rogers Locomotive Works, at Paterson, N. J. The capacity of the works is one engine a day. The company, which purchased the plant at receiver's sale about two years ago, received valuable concessions from the city on assumption that it would remain an independent company.

The Bullock Electric Manufacturing Co., Cincinnati, O., is to build a 300-ft. addition to their No. 2 shop, two stories high, which will be used principally for the manufacture of street car motors. Considerable new machinery will be installed. The company now has extensive improvements to its plant at Norwood under way, and at the time the affiliation with the Allis-Chalmers Co., Chicago, was announced, it was announced further extensions were decided upon.

The C. O. Bartlett & Snow Co., Cleveland, Ohio, reports a large number of inquiries for cement machinery, due largely to the fine showing made by concrete work at the Baltimore fire, while throughout the South a number of cement plants are to be erected to supply material for the Panama canal. The company is installing coal dust fueling outfits at the plants of the Iroquois Portland Cement Co., Caledonia, N. Y., and the Northwestern Malleable Iron Works, Milwaukee.

The National Electric Co., successor to the Christensen Engineering Co., Milwaukee, will exhibit its electrical and air brake apparatus at the St. Louis Fair. Part of their electrical exhibit will include a 1,500 k. w. alternating current generator. This unit will be in operation at the central power station, furnishing power for various purposes. In addition a number of smaller alternating and direct current machines will be exhibited, including a very complete exhibit of the Christensen air brake equipment.

The Monterey Light & Power Co. has been incorporated, with a capital of $500,000, to acquire and enlarge the electric light and power plant at Monterey, Mex. The president of the company is P. G. Gossler, of J. G. White & Co. Harry R. Tobey is secretary and treasurer. The directors are: M. Gossler, Chester Griswold, Robert H. Williams and Morris K. Parker. About 1,000 kw. of new equipment will be put in. The General Electric Co. will build a 500-kw. Curtis turbine. Two 240-kw. belt driven alternators, a 125-kw. engine driven exciter and two small belted exciter generators have also been ordered from the General Electric Co., together with 150 fan motors. The boilers will be of Babcock & Wilcox build.

The plans of the Cienfuegos, Palmira & Cruces Railroad & Electric Power Co. of Cuba have been considerably enlarged. The company is to construct nearly 90 miles of electric railway, to light eight towns, and to construct a 10,000 h. p. hydraulic plant. Four and a half miles of electric tramways will be built in Cienfuegos. From Cienfuegos the road will be built to Caonao, then to Palmira, to Cruces, to Ranchuelo and Santa Clara. Another section will be built from Caonao to Guaos and from there to Cumanayagua. The line will be standard gauge. The power plant will be built at the Hanabanilla falls, which are known as the Niagara of Cuba. The available head, it is estimated, will be about 700 ft. Bruno Diaz, of the Bruno Diaz Co., of Cuba, is president. Contracts are expected to be let inside of three months.

TRADE CATALOGUES.

Pellew-Harvey, Bryant & Gilman, of Vancouver, B. C., engineers and chemists, have sent out a 4-page illustrated folder, with their list of charges for assays and reports.

The Joseph Dixon Crucible Co., of Jersey City, N. J., in its April, 1904, edition of *Graphite*, gives a number of favorable testimonials regarding the company's crucibles and lead products, interspersed with many interesting anecdotes.

The Northern Electrical Manufacturing Co., of Madison, Wis., is sending out a new series of catalogues and folders, taking up individually the types and specifications of multipolar motors, electrically operated valves, generators in lighting service, in metal working, in pumping service, elevator service and various other applications.

The Laclede Fire Brick Manufacturing Co., of St. Louis, Mo., has issued an abridged catalogue of its fire brick and fire clay material for blast furnaces, cupola linings and similar service. The bricks are shown in standard and special shapes for the particular uses to which they are adapted. Locomotive arch tiles, grate settings and kiln floor tiles are also shown, giving a list of sizes and other specifications, together with the prices.

The Sederholm boiler, built exclusively by the Allis-Chalmers Co., of Chicago, Ill., is given considerable attention in catalogue No. 54, a recent 58-page publication tastefully designed and executed. The catalogue contains a treatise on the requirements of a good boiler, and takes up the subject of combustion, beginning with a candle flame, advancing gradually to the present modern methods, and particularly those in use in connection with the Sederholm boiler, pointing out the vital points of a boiler and showing where the Sederholm boiler meets all these requirements. A few necessary illustrations of the boiler and a number of tables on the properties of steam are added.

GENERAL MINING NEWS.

Petroleum Development.—The operations in the eastern oil fields during March, according to the Oil City *Derrick*, were as follows: Pennsylvania completed 595 wells, 170 dry, with a production of 5,626 bbl.; Ohio completed 248 wells, 12 dry, production 2,238 bbl.; Indiana completed 240 wells, 26 dry, production 3,544 bbl.; West Virginia completed 182 wells, 55 dry, production 3,018 bbl.

More wells were completed in March than in February, and an increase in new production was registered, but there was a general decrease of field operations, due somewhat to a declining market.

ALABAMA.

WALKER COUNTY.

Red Star Coal Co.—This company has been incorporated, with $20,000 capital, to operate a coal property at Horse creek. Development has already been begun. G. J. Grant is president; S. J. Garrett, secretary and treasurer. The office is at Birmingham.

ARIZONA.

COCHISE COUNTY.

Copper Queen.—This new 2,000-ton smelter at Douglas, was blown in March 23. About 2,000 men will be employed when running full blast. The works are yet a couple of months from completion. The old works at Bisbee are still in full blast. Ground was broken for the new works in April, 1902, and construction has been continuous since under W. M. Adamson, formerly of the United Verde works at Jerome. Electric motors and cranes do most of the interior work. Oil is used as fuel under the five 500-h. p. boilers. The 13 engines have a total rating of 4,950 h. p.. Four stands of converters are provided. The power is in excess of the smelting capacity and provision has been made for more furnaces, as they may be needed. The smelter at Nacozari is to be abandoned and the concentrated ores brought to Douglas for reduction. Flux will be secured from the company's mines at Morenci and Globe and through purchase of custom ores. A large sampling plant is being constructed.

Paradise.—This copper property of five claims near Paradise, in the Chiricahua mountains, has been bonded for a year to Geo. H. Crosby, of Duluth, Minn., for $35,000.

MARICOPA COUNTY.

Medicine Chief.—This bismuth mine, east of Mesa, owned by F. Webb, is reported sold to the Saxon Co. for $75,000.

MOHAVE COUNTY.

(*From Our Special Correspondent.*)

Golden Gem.—George F. Milliken, of New York, has a bond on this mine at Cerbat, and has several men at work taking water from the lower levels.

Homestake.—Much work is done on these mines on Silver creek and good gold and silver ore is produced.

Mohave Gold Mining Co.—This company, in San Francisco district, is working three shifts on the Midnight mine, and getting good ore. The shaft will be continued down.

Osborne.—This group of gold and copper properties on Bill Williams Fork, is running an adit to tap ore at 150 ft. One of the veins outcrop along a hillside for several hundred feet.

St. Cloud.—The new mill at this mine, on the Rio Sandy, is almost completed. The mine is being developed considerably and shows a big vein of good gold ore.

PRINCE COUNTY.

Silver Bell District.—The copper mines of the Old Boot group and other mines of the district are soon to be connected by rail with the overland trunk line, the Southern Pacific at Red Rock. The surveys have been completed and the grading is half done. Trains may be running by June, and smelting works will soon after be in operation on the Imperial Copper Co.'s ores at or near Red Rock.

SANTA CRUZ COUNTY.

(*From Our Special Correspondent.*)

World's Fair.—This noted property, which for the past ten years has been worked intermittently by Mr. and Mrs. Frank Powers, is reported sold to capitalists from Minnesota at the rate of $500,000 for the property, one-quarter being retained by Mr. Powers. The ores are largely a rich silver-lead very desirable for smelting, and are shipped from Patagonia station on the Guaymas branch of the Southern Pacific to the smelter at El Paso.

CALIFORNIA.

AMADOR COUNTY.

Capt. Glenn.—This old mine near Volcano, is worked by Robinson Bros., who are keeping a 2-stamp mill busy and making good clean-ups.

BUTTE COUNTY.

Good Enough and Golden Summit.—J. R. Durfee has taken a lease and bond on the Good Enough placer, near Stirling, and will open it as soon as the weather permits. He will also work the Golden Summit mine.

CALAVERAS COUNTY.

The recent rich strike in the Royal mine at Hodson has started prospecting. The ore is a grade requiring large mills, and the Royal has proved that with its 20 stamps it can be treated profitably. It is rumored that 120 more stamps will be added to the mill this summer. There is also an old 40-stamp mill on the property.

Lloyd.—A new engine and mill have been installed at this mine, Central Hill.

ELDORADO COUNTY.

New Highland Co.—This company, at the Mameluke hill mine, near Georgetown, is hydraulicking day and night. The claim was formerly a large producer.

INYO COUNTY.

Casey.—The Southern Belle Co. has made its first payment on this group of mines and work is to be resumed.

Inyo Marble Quarry.—This company is again shipping rough marble to the dressing works at Marmol, having a contract to furnish a large quantity of finished material.

MARIPOSA COUNTY.

Hornitos Gold Mining Co.—Arrangements are being made by this company to equip its property with machinery and do further development work.

MONTEREY COUNTY.

Big Four.—G. W. Osborne, superintendent of this mine in Los Burros district, reports all work on the North Fork stopped until the subsidence of Willow creek.

NEVADA COUNTY.

California Grass Valley Gold Mining Co.—This company has been organized at Grass Valley to work the California mine, three miles from that place. The officers of the new company are: G. R. Tuttle, president; I. Haas, vice-president; P. Larue, secretary, and Citizens' Bank, treasurer.

RIVERSIDE COUNTY.

T. C. Beecher and F. M. Meeks own several tourmaline mines near Cahuilla, on Pine mountain, 21 miles from Hemet, from which they are taking numerous valuable gems.

SANTA CLARA COUNTY.

San Juan.—The first shipment of quicksilver has been made from these mines, near San Jose. Large furnaces are now being constructed.

SHASTA COUNTY.

Central.—At this mine, A. A. Anthony, superintendent, the extensive work done is to be continued.

SIERRA COUNTY.

Sierra Buttes.—It is reported that the sale of this famous old property at Sierra City has been practically completed and that the new owners will take possession in April. The purchasers are the Hayes Bros., of San Jose. They have also bonded the Buttes Saddle mine adjoining.

SISKIYOU COUNTY.

Golden Eagle.—The old rich pay shoot of this mine at Indian creek has been struck. In addition to this body of ore, in running a level, a large body of low-grade ore was opened. A 10-stamp mill will be put up as soon as possible.

Headwater Mining Co.—This company, owning mining properties near Yreka, is about to open several of them. Jos. Johnston, representing the company, is also arranging to obtain capital to bring a railroad into Scott valley and build a smelter there.

Overton.—While running the 300-ft. tunnel in this mine at Cow creek a new rich vein has been developed, supposed to be a continuation of the Highland ledge which has been paying so well.

TRINITY COUNTY.

Enterprise.—Mark Manley, superintendent of this mine on North Fork, is arranging to put on more machinery and do additional development work.

Lone Jack.—At this mine the new tunnel on the mill level is in 210 ft., with 50 ft. to go to reach the ledge.

TUOLUMNE COUNTY.

Galena.—A tunnel is being run on the ledge of this mine at Groveland, to intersect a cross vein. A main working tunnel is also to be driven.

Tainter.—Chas. L. Lang has a force of men doing development work on this mine near Sonora. At one time, with very little development, the mine paid well.

COLORADO.

CHAFFEE COUNTY.

Mascot Mining Co.—This company, W. E. Mason, of Illinois, president, has purchased the Delphine group from A. H. Smith and associates of Salida for $10,000. This group is at the head of Bear creek, seven miles southeast of Salida, and consists of five claims. The claims will be consolidated with the Columbine group, in the same district, and owned by the Mascot company.

CLEAR CREEK COUNTY.

K. R. S.—The new building for this tailings mill, near Idaho Springs, is completed. The arrangement to treat the tailings from the Newton annex will soon be ready for operations.

M. & M.—This crosscut tunnel, near Idaho Springs, has opened the Little Helen lode, showing a foot of milling ore. The M. & M. tunnel is now in between 400 and 500 ft. It is being driven to drain the mine primarily.

Peters.—This tunnel property, near Idaho Springs, was taken over recently by eastern men under lease and bond and work resumed.

Sylvania Gold Mines Corporation.—This company has leased the Allen mill to treat the ore from its Mona mine on Bellevue mountain near Idaho Springs. Over 1,000 tons of milling ore are ready.

CUSTER COUNTY.

Murphy Mining Co.—This company, working the Silver Bar property, is reported to be preparing plans for a 200-ton reduction plant. Work in the mine is being pushed rapidly. D. J. Patterson, of St. Louis; Theodore Gardner and E. P. Thompson, of Lawrence, Kan., are said to be heavy stockholders.

Wolcott Gold Mining & Milling Co.—This company, working the P. & O. mine, near the Bassick, at Querida, is reported to be preparing plans for a large mill.

FREMONT COUNTY.

Montezuma Gold Mining & Milling Corporation.—This company at Coaldale, it is reported, has discovered a vein of fluorspar. Lord Osborne is president, N. E. Barnes of Colorado is vice-president. G. P. Kievenaar represents the Dutch holdings in the company.

GILPIN COUNTY.

(*From Our Special Correspondent.*)

Bledsoe.—This property in Gregory district has smelting ore at 100 ft., carrying 12.8 oz. gold, 49.8 oz. silver and 27% copper, or $315 to the ton. The lessees are taking out milling ore and getting ready to ship.

Golden Cloud Mining Co.—The shaft in this property in Russell district is down 600 ft. In extending the 400-ft. level, the company is opening up between 8 and 9 ft. of concentrating ore which will average nearly $10 to the ton. Mr. Tobias, Idaho Springs, is manager.

Missouri.—A new shaft building is to be erected and steam machinery installed at this property on Quartz hill at once. The property has shipped milling ore running up to 4 and 5 oz. gold to the cord, and its smelting ores gave values of $100 to the ton. John Lyng, Nevadaville, is manager.

Moose.—Smelting ores taken out from this mine in Pleasant Valley district at 60 ft., gave values of $58 to the ton at sampling works. P. McCann, Central City, is manager.

Newfoundland.—Free gold ore has been uncovered during the past week in the St. Louis Extension property on Gunnell hill, and in the 500 east level the ore carries assay values of 5.2 oz. gold, 88 oz. silver, or $148 to the ton. The property is being operated by its owner, George W. Mabee, Sr., of Denver.

Old Town.—Manager George K. Kimball, Jr., has ordered from the Denver Engineering Works, a 25 h. p. electric hoister for the Wautauga property. Power will be provided from the Old Town mine where a new Westinghouse electric plant is being installed. The big Worthington pump is being installed at the 1,500 pump station; the new gallows will have a vertical height of 45 ft. The property will turn out between 150 and 200 tons a day.

GUNNISON COUNTY.

West Gold Hill Mining Co.—This company has prepared plans and specifications for a 50-ton cyanide mill to be erected on West Willard creek this season. The company worked the Sellers claim all winter and followed the ore 200 ft. in the lime.

LAKE COUNTY—LEADVILLE.

(*From Our Special Correspondent.*)

The figures for March show a production of about 75,000 tons of all classes of material. This shows an increase in zinc ores and also shows the properties of the Iron Silver Mining Co. to lead in tonnage with a production of between 10,000 and 12,000 tons.

A. Y. & Minnie.—About 4,000 tons of milling and crude ore were shipped this month. The mill is handling about 1,000 tons a month of zinc sulphides.

Buckeye.—A streak of silver averaging 80 oz. silver is being followed. A winze is to be sunk on the streak, as it is dipping, and 50 tons have been shipped.

Diamond Gold Mines Co.—The drifts show fair grade ore bodies in all directions and the main drift has ore for nearly 200 ft. Shipments for March were 3,000 tons.

Dora-Daisy Lode.—The tunnel is being sent in rapidly and will soon be in line with the continuation of the celebrated Lizzie Lou ore shoot known to extend into this ground.

Forest City No. 2.—This property is to resume work at once.

Fryer Hill Mines Co.—Some 3,500 tons were shipped in March principally through the El Paso workings. The new Harvard shaft is going down.

Gallagher.—The old workings as well as virgin ground will be explored by Andrew Dyatt, who has a lease on this territory. He will operate through the old Mikado deep shaft workings.

Golden Curry.—The first shipment shows 30 tons fair grade ore assaying 40 to 50 oz. silver.

Last Chance.—Immense bodies of low grade milling ore have been opened up. Arrangements are under way for resumption on a large scale in the mine and also for improving the mill.

Midas Mining Co.—From the Midas and Coronado over 7,500 tons have been mined and much work done. The company has also retimbered the Penrose shaft. Pipe lines and machinery will now be put in and the Coronado and Penrose shafts will be sent down.

Morrison Combination.—This is in outlying country, with a $20 gold vein running through it. Plans are under way for placing a mill on the ground.

Park.—J. J. Brown is to operate this and other important gold belt territory.

Peerless Maud Combination.—Shipments have increased to 20 tons a day of good lead ore, most of which will average 50%. Milling ore is also shipped and is treated by the Last Chance mill. A new ore shoot running 50% lead has just been caught in this territory.

Resurrection.—Many improvements on the mill have been made, while considerable work has been done in the mine and the ore bodies opened up in all directions. The mill will handle 150 tons daily when it resumes work.

OURAY COUNTY.

Barstow Gold Mining Co.—The Bobtail mine worked by this company is employing over 100 men. The new mill is reported working satisfactorily.

Governor.—Arrangements are being made for a 10-stamp mill for this mine in the Sneffels district near Ouray. Kramer & Zangs are the owners.

Revenue.—About 60 men are to be added to the force at the mine near Ouray. Two large pumps have arrived which will drain the workings and allow work to resume.

Silverton Mining Co.—The mill of this company at the North Star mine on Sultan mountain, near Ouray, is to be remodelled and overhauled. It is stated that $25,000 will be expended for new machinery. The mill is expected to be working by June 15.

PARK COUNTY.

Hock Hocking.—This company near Alma, is said to be considering a concentrating plant. The property is reported to be opened up at great depth and well developed, with much ore in sight.

SUMMIT COUNTY.

Gold Pan Mining Co.—Work is to start at once at this property near Breckenridge, by piping water about four miles from the Blue river to a 4-ft. Pelton wheel. Power is obtained to run the air compressors, machine shop, hydraulic pipe-making plant and electric plant. Three hydraulic elevators are also supplied. Steam power is used through the winter. This

company also has a complete electric plant and power house operated by water power about four miles from Breckenridge. The entire Gold Pan plant is in good condition for active operation as soon as the season opens. The acreage of the company is estimated at 1,700 acres. Of this 850 acres are believed to contain gold, with an average stated value of 46c. per cu. yd. Geo. H. Evans is manager and Geo. E. West is president.

Jessie.—A 400-ton run was made with the 40-stamp mill recently, but was not up to expectations. About 10 men are employed, and another test will be made soon. T. R. Griffith is manager.

TELLER COUNTY—CRIPPLE CREEK.

(*From Our Special Correspondent.*)

On account of heavy development work, the Peggy Gold Mining Co. shipped only 180 tons at an average value of about $70 per ton. The El Paso averaged over a carload per day for March, value $60 per ton.

Calhoun Tunnel.—E. A. Corder has closed a contract with W. C. Calhoun, representing the management of the Calhoun tunnel under Cow mountain, to drive 1,000 ft. The entire length of the tunnel is to be 3,000 ft.

Dillon.—At this mine a number of sub-leases have been granted betwen the fourth and eighth levels and extensive development is going on. Some ore is shipped.

Gillett Mill.—This mill is nearing completion. The large steel tanks are in place. The motive power will be electricity.

C. K. & N.—The output of this mine for March was 1,000 tons, averaging $55 per ton.

New Boston.—It is reported that a vein 4 ft. wide has been opened at a depth of 35 ft. on this claim on Womack hill. Values are reported at $40 per ton. The property is owned by the Stratton Cripple Creek Mining & Development Company.

Portland.—It is said all repairs on shaft No. 1 will be completed by April 10, an additional shift will be at work on shaft No. 2 and the production kept at 300 tons per day to supply the mill.

Vindicator.—During March this mine shipped 1,200 tons, valued at $60 per ton, gross value for the month $70,000. The ore is mined between the sixth and tenth levels. The lower workings are filled with water.

IDAHO.

ADA COUNTY.

X-Ray.—A 20-stamp mill with Wilfley tables, a cyanide outfit, etc., have been purchased and will shortly be installed at this tunnel property in the Black Hornet district near Boise. C. H. Packenham is manager.

BLAINE COUNTY.

Minnie Moore.—The American Smelting & Refining Co. has contracted for the ore of this property at Bellevue for an indefinite period. In the past two years Irving E. Rockwell, president and general manager, and associates are said to have expended $200,000 in restoring the mine, which is now said to have immense values in sight. Water was tapped recently which has retarded work. Six pumps are in place.

ELMORE COUNTY.

Franklin.—It is reported that the new tunnel run by Larson & Greenough on this mine at Pine, has opened a ledge disclosing a large body of ore. Three tunnels are in the property, which is under bond for $250,000. A 10-stamp mill is now running.

IDAHO COUNTY.

(*From Our Special Correspondent.*)

Hogan Group.—This property will probably start again April 15.

Le Roy.—This low grade property which adjoins the Hogan group on Crooked river is being equipped with a 10-stamp mill.

Union.—This claim near Elk City has cut a narrow streak of high grade ore.

SHOSHONE COUNTY.

Bunker Hill & Sullivan.—The Kellogg tunnel of this company near Wardner, has broken into the ore body opened in No. 7 and No. 8 tunnel after being run for over two miles. On No. 7, which is 500 ft. above the Kellogg tunnel on the dip of the vein, the stope was 450 ft. long and in one place 105 ft. wide. This was at a depth of over 2,000 ft. on the dip of the vein. The ore body in the Kellogg tunnel is at a depth of between 2,600 and 3,000 ft. on the dip of the vein, which is at 45°. No. 7 is 250 ft. above No. 8, and the latter 250 ft. above No. 9, the Kellogg tunnel. The body of ore averages about 15% in lead and from 7 to 8 oz. silver.

Morning.—A 500-h. p. compressed air plant, with 50-drill capacity, is to be added at this mine, at Mullan and be in operation by September 15. It will be driven by a 500-h. p. electric motor operated by power from the Washington Water Power Co., at Spokane. A 1,000-h. p. air plant was installed three years ago with 100-drill capacity, which is still in operation.

Sixteen to One.—The dispute in connection with this property, in the Coeur d'Alenes, is reported settled out of court, and work will be resumed shortly by Finch & Campbell, who now control 700,000 shares. The Peter Bernier interests received 45,000 shares, and the Flink interests the balance of 255,000 shares. Finch & Campbell obtained the old Custer mill some time ago, spending $30,000 to bring it to 250 tons capacity. The Northern Pacific also built a branch to the mine. The litigation was started in 1899.

(*From Our Special Correspondent.*)

Chester.—A tunnel 900 ft. long has cut the ore, and a shoot from 2 to 3 ft. wide has been drifted for 15 ft., showing assays of 30% lead and 30 oz. silver. The Chester is near Spring gulch, 1½ miles from Osborn. Weber Bros., of Wardner, are interested.

Evolution.—At this property in the Coeur d'Alenes, located in 1878 by A. J. Prichard, a hoist, a pump and a compressor are being installed.

WASHINGTON COUNTY.

Iron Springs Mining Co.—About 20 men are starting work on this property in the Rapid river district near Weiser, excavating for the big milling plant which will be installed this summer. A 200-ton cyanide plant will be put in and be in operation next winter. Charles F. Macey is superintendent.

ILLINOIS.

VERMILION COUNTY.

(*From Our Special Correspondent.*)

Coal Miners' Wage Scale.—The joint convention of the Illinois Coal Operators' Association and United Mine Workers, after a session of 10 days, reached an agreement for the two years beginning April 1. The convention came near adjourning without agreement on account of the mining rate for the long wall mines in the thin vein coal of northern Illinois. The Interstate convention fixed the mining rate for the Danville district as the basing point for Illinois, and the same reduction was applied to all other districts of the State, but the miners contended that the mining rate in northern Illinois was already too low. The scale committee could not agree, and on March 30 so reported to the convention, and for almost two days the point was fought in open convention. The miners finally considered the question among themselves and accepted the reduction. Three questions later occupied most of the time of the joint scale committee—the day wage scale, the question of additional compensation for timbering the working places and a demand by the miners for shot-firers. After much argument the miners withdrew their demands and an agreement was reached April 2.

The only changes of consequence in the new agreement, besides the reduction of 3c. per ton in the mining rate and 5.55% reduction in all day work, yardage, room turning and dead work, is that the operators agreed to deliver the powder to the miners at their working places and also agreed that in mines where track is laid by the company when a miner is prevented from working on acccount of having no track through negligence of the company he shall be given day work on another working place. The joint convention accepted the report of the joint scale committee and adjourned on April 2 to meet in 1906.

The various sub-district conventions will be held during the next two weeks and the State officers have promised to keep the miners at work pending the action of these conventions. John Mitchell, president, was in constant attendance and took an active part in the deliberations of the convention and the scale committee.

South Westville Coal Co.—This company, Joseph H. Garaghty, of Chicago, president, which has just finished sinking the No. 2 mine at South Westville, is beginning to sink a shaft for No. 3, and will, within 60 days, begin on No. 4, both on the Chicago & Eastern Illinois Railway. The company may become a strong competitor of the Kelly Coal Co., now by far the largest producer in the district. It is reported that Mr. Kelly may sink another shaft this coming summer.

INDIANA.

VIGO COUNTY.

(*From Our Special Correspondent.*)

Coal operators of the Indiana bituminous district at their annual meeting, on March 29, re-elected Jacob Kolson, president; Hugh H. Shirk, vice-president; Phil. H. Penna, secretary-treasurer.

The miners of the eighth district have decided not to work with hoisting engineers who do not carry a mine worker's card. This may stop work in the block coal field. The miners' and engineers' delegates will hold a joint meeting soon to discuss the situation.

MICHIGAN.

COPPER—HOUGHTON COUNTY.

(*From Our Special Correspondent.*)

A company with a capitalization of $2,500,000, par value of shares $25 each, has been formed to explore 400 acres in section 15, adjoining the Baltic mine. Fifty thousand shares were issued in payment for the lands and 10,000 shares will be offered for sale at $1 each to provide funds for work, the remainder forming a treasury reserve.

Isle Royale Consolidated.—Steps will be taken shortly to open the lode cut at 400 ft. by the diamond drill last summer. This formation is evidently the Isle Royale amygdaloid, and the cores revealed considerable copper.

Quincy.—A small fire in No. 7 shaft at the 56th level north was recently extinguished with no serious results.

St. Mary's Mineral Land Co.—This company is exploring with a diamond drill south of the Winona mine.

Tamarack.—Work in No. 2 shaft has been suspended several days to repair the timbering. It is expected that it will be closed down for several weeks as soon as the new hoist at No. 5 shaft goes into commission.

Winona.—The third level drift south from No. 3 shaft is in 150 ft. and shows heavy copper. The fourth level drift south is in 200 ft. and opening good ground. Drifting south from No. 2 shaft on the sixth level has progressed 1,550 ft.

COPPER—KEWEENAW COUNTY.

(*From Our Special Correspondent.*)

Ahmeek.—A plant has been cut in No. 1 shaft at 210 ft., which will be the first level. No. 2 shaft is nearly 100 ft. deep.

Arnold.—The machinery at this property is being sold as rapidly as possible.

Cliff.—Diamond drill explorations are progressing favorably on this property, owned by the Tamarack Mining Co. One hold has been put down 300 ft. and bottomed in a formation indicating that the Kearsarge amygdaloid is near.

Phoenix Consolidated.—The stamp mill is operating satisfactorily now. About half of the mine's output is secured from mass and barrel work, and fully four-fifths of this is taken out of the St. Clair shaft.

COPPER—MARQUETTE COUNTY.

(*From Our Special Correspondent.*)

Saux Head.—This copper prospect is being explored by the Saux Head Copper Mining Co., Ltd. C. A. Stringer is president and J. C. Krieg, secretary, both of Detroit. Additional machinery has been purchased.

COPPER—ONTONAGON COUNTY.

(*From Our Special Correspondent*)

Hamilton.—This mine is worked by the Copper Crown Mining Co., of St. Louis, Mo. W. W. Guest, general manager. The tunnel is in 480 ft. and will be continued for 30 ft., when it should cut the Norwich vein. This formation will be explored thoroughly before continuing work.

Michigan.—A carload of mass and barrel copper has been shipped to the smelters at Portage Lake.

National.—The favorable developments at the Michigan mine have renewed interest in this adjoining property, and work may be resumed. It has produced considerable copper and paid $320,000 in dividends.

MISSOURI.

ST. FRANCOIS COUNTY.

(*From Our Special Correspondent.*)

Recent heavy rains greatly interfered with railroad traffic on the Iron Mountain, Bonne Terre and Missouri Southern railroads; all lost bridges and were troubled with washouts and landslides. The three county bridges over Big river were carried away, as also the railroad bridge at Bonne Terre and the southern bridge at Flat river. Travel was resumed April 1 and all trains are again on time.

Central.—This mine has resumed dividends, paying its 73d dividend of 50c. per month on March 31. The production has been brought up to the normal, and the discipline and spirit have greatly improved since the strike.

MONTANA.

FLATHEAD COUNTY.

Rustler Mining & Milling Co.—This company operates the Snowshoe mine, near Libby. The mills have been shut during the winter and nothing has been done except to install new machinery. The mill is expected to start about May 1, and will handle 225 tons of ore a day. Men are at work sinking the 160-ft. shaft. W. D. Wrighter is manager.

JEFFERSON COUNTY.

Basin Reduction Co.—This company at Basin, which handles all the ore from the Heinze mines at Butte, is to enlarge its concentrator to handle 2,500 tons a day instead of 1,500 tons, as now, and will increase by one-half the number of employes. The company has also started work on the dam below Basin, to hold the tailings. The main dam will be of timber and rock, 200 ft. long and about 22 ft. high. From this another dam about 600 ft. long will extend to the railroad grade. The dam will be completed in about four weeks.

Cataract Copper Mining Co.—The pyrite smelting plant of this company on Basin creek, eight miles from Basin, was blown in recently. Ground was broken about a year ago and work pushed rapidly by the Colorado Iron Works. The plant is guaranteed to treat 200 tons daily. Hot blast is used. Over 100 men are now employed at the works.

Golden-Sunlight.—These mines, five miles northeast of Whitehall, have been transferred to Eugene Ring. This group is said to embrace 20 patented claims, and has machinery and a concentrator which, however, is not adapted to the ore. Other machinery will be installed, it is reported, and the property worked. The ore is principally sulphide, carying gold and silver.

LEWIS & CLARKE COUNTY.

Whitlach-Union.—This mine, near Helena, is under bond and lease to Martin & Canole. The shaft has been timbered to the water level, and they will shortly pump out the water. This mine has produced nearly $4,000,000 in gold since its discovery.

MADISON COUNTY.

Grant Mines Co.—This company near Virginia City, is working the U. S. Grant and Fairweather mines, and is under the same management as the Bismarck-Nugget Gulch Co., operating the Toledo mines near Sheridan. It is reported that the company is about to add two leaching tanks to its plant and make several other enlargements. The mine is managed by Superintendent Walter M. Brown and A. M. Balfour.

YELLOWSTONE COUNTY.

General Shafter.—This mine, mill and cyanide plant at Summit was recently added to the company working the Dakotah group. About 12 men are at work under Thos. G. Port, superintendent.

Alder.—This company at Summit, recently purchased several additional claims and is pushing work on two tunnels, one to be nearly 2,000 ft. long, and the other 1,000 ft. long. It has a body of high grade ore, which is being mined and worked in the company's mill as it is taken out. The company is also sinking on the Kearsarge.

NEVADA.

ESMERALDA COUNTY.

(*From Our Special Correspondent.*)

Goldfield.—At the Combination mine surface trenching has disclosed the cross ledge now being developed on the January claim adjoining. The usual shipments from the Combination mine are being made. At the January claim the lessees are employing 42 men. The prospecting shaft is down 100 ft. with 30 ft. of drifting east and west of the 50-ft. level. The main shaft is down 65 ft., where good ore was struck. Over 200 tons have been shipped from this lease, the last returns from 35,603 lb. net were $2,750 gross and $2,534 net, the values being 7.57 oz. gold per ton and 1.33 oz. silver per ton.

SOUTH DAKOTA.

LAWRENCE COUNTY.

(*From Our Special Correspondent.*)

Clover Leaf Mining Co.—An independent hoist is being installed at the bottom of the main shaft, 700 ft. from the surface, and will be used in continuing the shaft to 800 ft. Water is giving little trouble.

Elliptic Mining Co.—An electric hoist will be built. Power will be supplied from the Lead Electric Light & Power Co., at Lead.

Golden Crest Mining Co.—The mill is receiving its supply from the main shaft, until the independent hoist is ready at shaft No. 4.

Gordon City Mining Co.—This corporation has been formed for the development of property at Maitland, bought for $40,000. Frank E. Little, of Minneapolis, Minn., is one of the incorporators. A fund has been provided for development and a mill.

UTAH.

BEAVER COUNTY.

(*From Our Special Correspondent.*)

Beaver-Harrison Mining Co.—This corporation has been formed at Salt Lake City with a capital of 1,500,000 shares, par value 5c. each. It is a consolidation of the Ben Harrison and Beaver Consolidated properties. J. J. Trenam, of Salt Lake City, is manager.

Majestic Mining & Smelting Co.—The property of this company, at Milford, is in the hands of a receiver. This action followed the filing of a petition by creditors of the company, including C. J. Caughey, of New York, its former secretary, asking that the corporation be declared an involuntary bankrupt. Negotiations have been pending looking to the sale of the entire company to the new Monarch company combine.

JUAB COUNTY.

(*From Our Special Correspondent.*)

Tintic Shipments.—From the Tintic district during the week ending April 1, shipments amounted to 145 carloads, as follows: Ajax, 3; Bullion-Beck, 12; Carisa, 2; Centennial-Eureka, 49; Dragon, 6; Garnet, 1; Gemini, 23; Grand Central, 19; Lower Mammoth, 1; Mammoth, 16; Tetro, 3; Uncle Sam Con., 4; Yankee Con., 3; May Day (concentrates), 1; Uncle Sam Con. (concentrates), 2.

PIUTE COUNTY.

(*From Our Special Correspondent.*)

Annie Laurie.—The lower or No. 5 tunnel being run to tap the ore bodies at depth is in 3,020 ft. The adit is 400 ft. under the present lowest workings.

Sevier Consolidated.—The working force at this mine is soon to be increased and the mill operated at full capacity. H. C. Lawrence, of Ogden, is manager.

Standard Power Co.—This concern was incorporated at Salt Lake, with a capital of 1,000,000 shares, par value $1. The company proposes to construct a 4,000 to 5,000 h. p. power plant on the Sevier river, near Marysvale, to furnish power and light to the mines, etc., in Piute and Beaver counties. Willard F. Snyder, of Salt Lake City, is president.

SALT LAKE COUNTY.

Bingham Consolidated.—Construction on a sampler will be started within 30 days for this property, it is reported. The plant will, it is said, be automatic throughout and will provide for 1,000 tons of ore daily, to pass without further handling to the furnaces. At present the smelter is reducing over 500 tons of ore daily, with three furnaces. In addition to the output of its own mines the smelter reduces the ore from the Grand Central and Lower Mammoth of Tintic and the Boston Consolidated, of Bingham, in addition to outside consignments, while in the next 30 days the management of the Fortuna of Bingham will begin filling a contract providing for the treatment of 3,000 tons monthly.

Fortuna Mining Co.—This company was incorporated March 10 with a capitalization of $300,000. J. D. Wood is president; M. B. Johnson, vice-president, and George F. Richards, Jr., is secretary and treasurer. The company acquires under lease and bond all of the Bamberger Exploration Co.'s interests in the old Fortune Co.'s property, including the mill, together with adjacent holdings belonging to Davis & Mullett, Elmer Hill, John Schneider and others and a group of 17 claims comprising about 200 acres near the Ohio Copper Co. property. Much work is reported done on the property. A contract is reported closed with the Bingham Consolidated to ship 3,000 tons a month. James Start, of Bingham, is superintendent.

(*From Our Special Correspondent.*)

Bingham Consolidated Smelter.—During the fiscal week ending April 1, the shipments of copper bullion aggregated about 180,000 lb.

Davis-Gebhardt.—This Bingham property has been bonded to William Ochs, of Salt Lake City, for $100,000.

New England Gold & Copper Co.—A jigging plant to handle 50 to 75 tons per day is being installed at this Bingham property.

Utah Consolidated Smelter.—Shipments of copper bullion during the fiscal week ending April 1 aggregated 302,000 lb.

United States Smelter.—During the fiscal week ending April 1 the copper bullion shipments aggregated 253,366 lb.

SUMMIT COUNTY.

Daly-West.—The new tailings mill of this company, at Park City, is completed. The building is 82 by 56 ft. and 40 ft. high. It is 400 ft. northeast of the present mill and cost about $50,000 to equip. The new plant embraces a 5-ft. Huntington mill for grinding the coarser tailings, seven slime settling and classifying tanks, two 2-compartment jigs for treating coarser tailings, six concentrating tables and one Wilfley slimer. The first work will be upon the tailings dump, which it is expected to treat at a cost of not more than 15c. per ton, with a profit of from 30 to 50c. per ton. The plant is in charge of Superintendent Sherman and requires but two men on each eight-hour shift.

(*From Our Special Correspondent.*)

West Quincy.—This company has been organized to take over the property recently operated by the J. I. C. Mining Co. at Park City.

WASHINGTON.

STEVENS COUNTY.

King.—Arrangements for the construction of a 150-ton smelter this spring are reported completed for this mine, at Valley. The mine is equipped with three 50-h. p. boilers, five drill air compressors, two Sullivan air drills and a complete electric light plant. Much develop-

ment has been done and is being pushed now. J. B. Tuttle, Jr., is superintendent.

Northport Smelter.—The six furnaces of this smelter were blown out March 26 and it was stated that work would be resumed in about 30 days. It is reported that a new sampler, to handle 1,000 tons daily, and crusher are going in and repairs made and that a converter is being considered.

WEST VIRGINIA.

MC DOWELL COUNTY.

United States Legal Corporation.—This concern, of Washington, D. C., has bought 2,100 acres of coal land in this county and will begin work at once. It is also said that 1,000 coke ovens will be built. The sale was announced by H. Lyon Smith, of New York.

FOREIGN MINING NEWS.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—For the week ending March 26 shipments aggregated 16,778 tons as follows: Granby, 11,970; Mother Lode, 3,488; Emma, 396; Oro Denoro, 924; total for the year to date, 199,145 tons.

Montreal & Boston Consolidated Mining & Smelting Co.—This company has been consolidated with the Morrison Mines, Ltd. It was formed at Ontario with a capital of $5,000,000. The property now owned includes the Sunset, Crown Silver, C. O. D., Florence, Morrison and one-half of the Little Buffalo, and also the smelter plant of the Montreal & Boston Copper Co., at Boundary Falls. The smelter has two furnaces in operation and a third one on the ground. The company intends adding a fourth furnace and a converter plant which will enable it to smelt 1,500 tons of ore per day. Andrew Laidlaw is the prime mover in the enterprise. A. H. Kenyon filed an injunction suit to restrain the Morrison Mines, Ltd., from selling the property to Andrew Laidlaw. Judge Belt granted a temporary restraining order, effective when Kenyon files a bond for $5,000.

BRITISH COLUMBIA—EAST KOOTENAY DISTRICT.

Imperial Coal & Coke Co., Ltd.—This company has been organized at Montreal, with W. Herbert Evans, president; Jas. W. Pyke, vice-president, and Humes Hall, secretary-treasurer. The capital is $4,500,000 and about 60,160 acres of bituminous coal lands on Fording river, east of Elk river and north of Michel, have been secured. The northern limit of the area is 40 miles from Michel and extends south more than 30 miles to a point seven or eight miles north of Michel. Coke is to be produced by the company on a large scale.

BRITISH COLUMBIA—NELSON DISTRICT.

Gold Cup.—Wolfle and Dawault, who have this property, near Ymir, under bond, contemplate the erection of a larger mill, to be driven by water power from the Salmon river, and also the construction of an aerial tramway. The ore is quartz. The principal values are in copper sulphide saved on concentrating tables.

BRITISH COLUMBIA—ROSSLAND DISTRICT.

Rossland Ore Shipments.—For the week ending March 26 shipments amounted to 9,869 tons as follows: Le Roi, 5,504; War Eagle, 1,175; Centre Star, 1,560; Kootenay, 350; Jumbo, 300; Le Roi No. 2, 905; White Bear, 75; total for year to date, 110,384 tons.

Rossland Power Co.—The plant of this company is expected to be working in 60 days. The 50-ton oil concentrating plant will not be installed at present.

MEXICO.

CHIHUAHUA.

Parral Mines, Ltd.—The affairs of this company are to be wound up and Walter Daingerfield, of London, one of the directors, is appointed liquidator. The company was a London concern, registered in May, 1901, to work the Parral mine, in the Parral district, which, however, failed to disclose ore in paying quantity after operations had caused a loss of £10,706. The property was amalgamated with the Diaz and Beckman mines, in the same district.

MINING STOCKS.

(Full quotations given on pages 588 and 589.)

New York, April 6.

Apparently the investing public is still indifferent, and the stock market shows a narrow price-movement generally. The uncertainty in the industrial list seems to be reflected in mining shares, notable the gold and silver. These are somewhat depressed by the inability of the United States Reduction & Refining Co., the Colorado mill combination, to resume dividends, owing to the labor troubles at the mines; by the smaller gold output of Cripple Creek, and by the levying of another batch of assessments by the Comstock mines.

In the copper section, Amalgamated shows variable trading at $48.25@$51.125 and Anaconda at $17.75. Greene Consolidated, of Mexico, appears in better form, and has advanced to $14.00, the highest point in some time. British Columbia is uninteresting at $2.125@$2.50.

Standard Consolidated, of California, made a sales at $2.75. Few Cripple Creek, Colo., stocks were dealt in. Isabella brought 29c. and El Paso, 76c.

In the Comstock group, Caledonia changed hands at $1.30, Mexican at $2.55, Hale & Norcross at 88c. and Sierra Nevada at 82@83c.

Recent auction sales were 1,000 shares Standard Gold Production Co., at $51 for lot; 100 common shares Virginia Iron, Coal & Coke Co., at $19; 60 shares Montreal & Boston Copper Co., of British Columbia, at 50c. per share; 1,575 shares Markeen Copper Co., of Arizona, at $150 for lot; 500 shares Number Seven Mining Co., at $15 for lot; 10 shares Union Copper Co., of North Carolina, at $5.62 per share; 300 shares California Copper Co., at $19 for lot; 10,000 shares Bacas-San Marcos Mining & Milling Co., $5 for lot; 500 shares Oil Fields of Mexico Co., $3 per share.

Boston. April 5.

(*From Our Special Correspondent.*)

Copper shares are getting out of the depths of despondency, so to speak, and sentiment is becoming quite hopeful. At times there is quite pronounced trading and advances so far are well maintained. The improvement in the metal trade is having its effect in the share market, and, although erratic at times, the general conditions seem to be on the mend. Centennial copper forged to the front last week and was made quite active through manipulative tactics. Lawson came out for it very strong, and made good in the market to the extent that the price is up $4.75 to $21.75. The annual meeting of the company was held to-day, but no change was made in the directorate. The report shows $100,279 expended during 1903, and a deficit of $12,218 Dec. 31, 1903. This does not include any of the assessment money called early this year. The Arcadian mill, purchased early in the year, will be ready to start production early in July. Bingham has also been a notable feature, having advanced $3.12½ to $23.12½. This company has made an advantageous contract with the American Smelting Co., which covers a term of years. Tamarack has gone up $4 to $99. The annual report issued early this weeks shows net profits equal to $4.75 on the stock. The report speaks of the improvement in the territory tributary to No. 5 shaft.

Utah Consolidated has been quiet, fluctuating between $33.75 and $34.25. The annual report was favorably received, showing, as it does, earnings equal to $3.46 for 1903. Old Dominion sold up $2.25 to $14.75 on good buying. Net earnings for March are estimated at more than $75,000. Mohawk is $2 higher at $41, and Allouez has gone up $1 to $5.37½ on urgent buying. Quincy is $7.50 higher at $89.50, and Parrot is $1 higher at $26. Daly-West has held between $25 and $26, with a fair, active market on it. Continental zinc started from $7.50 to $10 to-day on sales of less than 500 shares. Copper Range Consolidated is again coming into prominence and has gained $1.12½ to $44. A dividend in June is now talked.

The market broadened out materially to-day, and now that the gas hearing is at an end, there is a possibility that the stock market may get a little more attention. Incidentally the gas hearing brought out the fact that T. W. Lawson had a plan to consolidate the prominent Lake Superior mines in the summer of 1903, but it was abandoned. It provided for a $50,000,000 company of 500,000 shares to be known as the Lake Superior Securities Co., and embraced the Calumet & Hecla, Tamarack, Quincy, Copper Range Consolidated, Trimountain, Wolverine, Centennial and Osceola.

Colorado Springs. Mar. 31

(*From Our Special Correspondent.*)

The condition of the market during the past week has been far from satisfactory, and the prospect for stronger prices in the immediate future is not encouraging. Quotations have not declined materially, but the volume of trading has been small, only the higher priced stocks being at all active. El Paso was active and strong, but aside from this the market was featureless. The threatened renewal of labor trouble in the Cripple Creek district caused some uneasiness among the mine owners, and to this can be attributed the listless condition of the market, but there now appears to be no foundation for the belief that further trouble will occur.

Salt Lake City. April 2.

(*From Our Special Correspondent.*)

Business was very light this week on the Salt Lake mining exchange. The trading done was confined to a few of the leaders, all of them displaying some weakness. The slump in Daly-West came as a surprise to many, and its manœuvres have been watched with interest. While officials of the company insist that nothing in the condition of the mine has justified any shrinkage, yet the impression is general that the dividend will be trimmed a little. That negotiations are still pending with officials of the Federal Lead Co. was practically admitted by President Bamberger this week, he stating, however, that nothing could be said at this time. Some attribute the lowering of the stock to this, believing there is a concerted movement to depress the stock. Tetro has transferred heavily, more than 34,000 shares. This stock has fallen about 5c. a share since Monday.

During the month of March nine Utah mines participated in the distribution of $333,500 in dividends, the contributors being Annie Laurie, $12,500; Century, $3,000; Daly-West, $117,000; Gemini, $50,000; Grand Central, $25,000; Horn Silver, $20,000; Sacramento, $5,000; Silver King, $100,000, and Utah, $1,000.

San Francisco. Mar. 31.

(*From Our Special Correspondent.*)

Trading in the Comstocks this week has been a little more active. The North End stocks were generally in pretty good demand, and advanced in the early part of the week, falling off a little, however, towards the close. The Gold Hill stocks were rather quiet.

Some quotations noted were: Ophir, $6@$6.15; Mexican, $2.50@$2.60; Consolidated California & Virginia, $1.90@$2; Sierra Nevada, 75@80c.; Yellow Jacket, 35@36c.; Potosi, 27c.; Belcher, 28c.; Gould & Curry, 45@50c. per share.

On the San Francisco & Tonopah exchange prices were fairly steady, but the market was not specially active. Montana Tonopah brought $1.25@$1.30; Tonopah Midway, 35c.; Evelyn, 33c.; McNamara, 22c. per share.

On the California exchange trading was fair, and prices generally steady. Sterling sold for $2.50; Home, $1.50; Monte Cristo, 75@80c.; Occidental, 12c. The heaviest trading was in Home and Occidental.

San Luis Potosi. Mar. 30.

(*From Our Special Correspondent.*)

Exchange on New York went up to 220¼, but closed Saturday at 219, though the parity of exchange on the price of silver in New York Saturday was 228¼.

Mining stocks have been somewhat more active, but the prices remained low. Victoria, of El Oro, brought only $105; Dos Estrellas, $1,600; Noche Buena, $8; Luz de Borda, $65; La Union, $52, and Aurora, $7. Of other camps, Augustias brought $40; San Felipe de Jesus, $16; San Rafael, $1,715, and Soledad, of Pachuca, $680.

COAL TRADE REVIEW.

New York, April 6.

ANTHRACITE.

April has opened with a brisk demand for anthracite from all consuming territories that are now able to receive coal. Sales agents report spring buying up to the full average of the past few years, though, of course, there is hardly the eagerness that there was last April, when the lessons of the strike were still fresh in the minds of consumers. Buying is particularly strong along the Atlantic seaboard and in all-rail territory. Many householders have already started to put in coal, as retail dealers in many cities have reduced prices. The reductions are not always equal to those on wholesale trade; thus, in New York the April discount is but 40c. The outlook favors a steady demand and a large output for the next two months. What will happen later remains to be seen.

The Interstate Commerce Commission can now, in its investigation of the anthracite railroads, demand the production of the Temple Iron Company's contracts with several railroad companies and also the 65% sales contracts of the railroads with the independent operators. These contracts were offered in the hearings last May, but the attorneys for the railroads objected because the contracts did not refer directly to interstate commerce. The most important ruling of the Supreme Court seems to be that any person with a grievance against any railroad company, whether the grievance is real or imaginary, can go before the commission and the commission must investigate his grievance. The Interstate Commerce Commission consequently should have plenty of work to do from now on.

In the Northwest trade is light. Dealers have reduced prices, but the coal-burning season is about over, and no coal is expected to arrive by lake for a month yet. In Chicago territory there is a very fair demand for coal at the April prices, but receipts of all-rail coal are as yet scanty. Along the lower lakes and in Canadian territory ordering is active, but conditions along the railroads are interfering with a heavy movement of coal. Along the Atlantic seaboard there is an excellent demand, and orders from this territory, already in the hands of sales agents at New York, are more than there is any possibility of the companies being able to fill this month. Dealers, particularly at points along Long Island sound, are giving attention to anthracite business, and a heavy tonnage is afloat. Buying of the small sizes has already fallen off with warmer weather. April prices, f. o. b. New York harbor shipping port, are as follows: Broken, 4.25; stove, nut and egg, $4.50.

BITUMINOUS.

The Atlantic seaboard bituminous trade is in a fairly good condition. The arrivals of coal at tidewater have been very large. A week ago coal was accumulating along the railroads. Since then the railroads have cleaned up these accumulations and are now giving prompt shipment to all coal, the result being that some coal actually reaches tidewater in four days from leaving the mines. Such prompt shipment has not been seen in many a month. Apparently both the new transportation schedule and the plan of the Pennsylvania railroad to use shorter trains and make quicker time have worked very well, since their introduction on April 1. This improvement in transportation, however, does not seem to have affected car supply as yet, but it certainly leaves very little coal along the railroads to arrive at tidewater.

A large amount of contract business has been taken during the past week, and at rates favorable to consumers. Eliminating some cutting at the lower Chesapeake ports, and this cutting has been rather severe on large tonnages, the present outlook is that there will be a profitable year's business for all concerned, unless allowances should be made toward the end of the season.

Any prospects of serious labor troubles this year in the bituminous fields shipping to tidewater are remote. The joint convention at Altoona, and agreements by concerns not represented there, have resulted in reductions in the mining scale of from 3 to 9c. per ton. The term of contract in most cases is reported to be for one year.

In the far east there is some demand from mill operators for extra cargoes of coal. Evidently some shortages must be filled. The movement of coal is favored by the fall in freight rates during the past 10 days. Trade at Long Island sound ports remains dull, dealers there now giving their attention almost wholly to anthracite, but at those points in sound territory where ice has prevented receipts until recently, there is fair demand. Trade at New York harbor points is quiet. Ordinary grades of Clearfield now sell at $2.60@$2.75, f. o. b. New York harbor shipping port. In all-rail territory there is a temporary falling off in demand, due to passing causes.

Transportation from mines to tidewater is excellent, coal running through in four or five days. Car supply at the mines is 45 to 50% of the demand. In the coastwise vessel market vessels are in fair supply, with rates weak. It is thought, however, that the offerings of anthracite for shipment will keep up rates for the next few weeks. We quote current rates from Philadelphia as follows: Boston, Salem and Portland, 75c. for large craft; Providence, New Bedford and Long Island sound, 65@70c.; Lynn, Newburyport and Portsmouth, 80@85c.

Birmingham. April 4.

(*From Our Special Correspondent.*)

There is a little slack felt in the coal market in Alabama, although the production is still heavier than it was at this time last year. A railroad car shortage was reported for a day or two during the past week. Three new mines will be in full operation and shipping coal during the coming week in this State, the railroad extension in the western part of Jefferson county making this possible.

The Tennessee Coal, Iron & Railroad Co. has introduced coal cutting machines at Pratt City, operated by convicts, five machines, worked by electricity, being put in. The coal cutting machines were taken from free-labor mines because of an unsatisfactory scale for coal mined with machinery.

On May 2, in Birmingham, the coal lands, mines and appurtenances of the Broken Arrow Coal & Iron Co., in St. Clair county, will be sold at public outcry by a special master to satisfy bonds, interest and mortgages on the property. No bids for less than $25,000 will be received and each bidder must put up a forfeit of $1,000 when the bid is made. The property is considered good coal property.

Cleveland. April 5.

(*From Our Special Correspondent.*)

The boats are loading for their first cargoes up the lakes for this season. However, it is hardly likely that any of them will get away before very late in April, if they are not held in port until the first of May, or even the middle of it. The winter, having been long and severe, has frozen the channels more deeply than usual. The thawing weather which is necessary at both the Sault and Macknac, has not been forthcoming, and April finds the channels blocked. The Detroit river is open below Detroit, but above that there is not much change. The demand for coal at the lakes will not be very strong for the present. The call for steam coal is on the increase, and the market has been holding its own against influences which ordinarily would have caused weakness, such as the better supply of equipment with which to move the material. The market has therefore seen no change in prices, Pittsburg steam coal holding at $1.20@$1.30 at mine, with Ohio coal running $1.25@$1.30 at mines. The demand for slack has been good also, but the prices have not been quite so strong and the price is $1@$1.10 at mine. The easing of the railroad situation has caused an easier tone in the coke market. Good 72-hour coke is bringing $2.25@$2.50 at the oven and furnace coke, $1.75 at the oven. High sulphur foundry coke brings $2@$2.15 at the oven.

Chicago. April 4.

(*From Our Special Correspondent.*)

Under the stimulus of the 50c. reduction, effective April 1, sales of anthracite have been heavy in the last three or four days. There is a demand for all-rail coal, which is slow in coming forward, and with the prospects of a late opening of lake navigation, due to the heavy accumulation of ice at the Straits, this demand will doubtless increase. The new prices are $6 for stove and chestnut, and $5.75 for grate anthracite, f. o. b. Chicago. This business is probably heavier than in previous years at this season, owing to the severe winter. Dealers say the whole month is likely to be good, on this account.

The market for bituminous is quiet, with only local variations due to the troubles at the Iowa mines and consequent shortage from that source. To all appearances these troubles will soon be adjusted, and there is little apprehension of serious effects on the market through this source. As regards Indiana and Illinois, the present is a dull season, with competition sharp for the comparatively small amount of sales made. Eastern coals are in light demand also. Quotations are practically unchanged from last week: Smokeless, $2.70@$3.15; Hocking, $2.90@$3.15; Youghiogheny, $3@$3.25; Indiana and Illinois, $2@$2.50 for lump, $1.70@$1.85 for run-of-mine, and $1.40@$1.60 for screenings. The best trade is in the low-priced grades of Illinois and Indiana. There are said to be larger sales of smokeless, due to the certainty of delivery now. With the settlement of labor troubles in Illinois, announced to-day, there is removed from the market the probability of change in prices or quantities of the mines of the State and the market for bituminous seems destined to continue dull for several weeks.

Pittsburg. April 5.

(*From Our Special Correspondent.*)

Coal.—The proposed meeting of coal operators to arrange prices for the year was held and it is now announced that the market will be an open one. A leading producer is quoting the following prices f. o. b. at mine: Run-of-mine, $1.20 a ton; ¾-in., $1.30; 1¼-in., $1.40; slack, 80c. The Pittsburg Coal Co. is reported to have received a large contract from the United States Steel Corporation for its plants in the Pittsburg district. While the report that an order has been given is confirmed officially, the tonnage and the price are not given out. The rivers are still navigable, and the Monongahela River Consolidated Coal & Coke Co. shipped several million bushels of coal to lower ports during the week. Two large tows went out to-day and will probably be the last for some time. All the river mines are in full operation, there being plenty of empty coal boats and barges on hand. The railroad mines are also running pretty steadily, but the car supply is not the best.

Connellsville Coke.—The car supply has greatly improved and shipments were over 1,000 tons heavier than the previous week. The production also was greater. Prices remain unchanged, furnace coke being quoted at $1.75@$1.85, and foundry at $2.25@$2.50. The production for the week of standard Connellsville coke was 226,873 tons, and the shipments aggregated 10,223 cars, distributed as follows: To Pittsburg river points, 3,493 cars; to points west of Pittsburg, 5,385 cars; to points east of Everson, 1,345 cars. This shows an increase of 1,206 cars, compared with the previous week.

San Francisco. Mar. 31.

(*From Our Special Correspondent.*)

The coal market remains quiet and steady. There is no material change in prices.

Pacific coast coals in large lots to dealers are quoted as follows: Wellington and New Wellington, $8; Richmond, $7.50; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coss Bay, $5.50; white ash, $5.25. For Rocky Mountain coals, ex-car, to dealers, prices are $14 for Colorado anthracite, $11.50 for Castle Gate, Clear Creek, Rock Springs and Sunnyside. Eastern coal is nominal at $14 for Pennsylvania anthracite, and $13 for Cumberland. Foreign coal in cargo lots is quoted at $13 for Welsh anthracite, $8.50 for cannel, and $7.50 for Wallsend and Brymbo.

Foreign Coal Trade. April 6.

Imports of fuel into Spain for the full year are reported by the *Revista Minera* as follows, in metric tons:

	1902.	1903.	Changes.
Coal	2,136,819	2,085,429	D. 51,390
Coke	245,794	258,167	I. 12,373
Totals	2,382,613	2,343,596	D. 39,017

These imports were chiefly from Great Britain. The exports of coal were very small, amounting to 9,676 tons in 1902, and 3,127 tons in 1903, a decrease of 6,549 tons.

The production of coke and of briquettes from coal is reported as below, the figures being in metric tons:

	1902.	1903.	Changes.
Coal mined	2,735,620	2,700,835	D. 34,785
Lignite	91,017	97,278	I. 6,261
Total	2,826,637	2,798,113	D. 28,524
Coke made	404,503	450,474	I. 45,971
Briquettes made	331,957	339,120	I. 7,163

In addition to the coke given above, there was a production of gas coke estimated at 170,000 tons in 1903, from the gas works of the larger cities. About 53 per cent of the coal was mined in the Asturias.

Messrs. Hull, Blyth & Co., of London and Cardiff, report, under date March 26, that the market remains quietly firm for best large at last prices. Smalls are weak. Quotations are: Best Welsh steam coal, $4.14; seconds, $3,90; thirds, $3.72; dry coals, $3.66; best Monmouthshire, $3.48; seconds, $3; best small steam coal, $1.98 seconds, $1.62; other sorts, $1.50.

The above prices for Cardiff coal are all f. o. b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f. o. b. Newport, both exclusive of wharfage, but inclusive of export duty, and are for cash in 30 days less 2½% discount.

IRON TRADE REVIEW.

New York, April 6.

The iron market shows in most departments a much stronger tone. Business is evidently improving, as is shown by the volume of orders for raw materials. Pig iron has been extensively bought, and manufacturers have begun to make contracts for second-half delivery. Prices, accordingly, are generally firmer.

In finished material there is an improvement also, which is manifest in nearly all lines. The chief exceptions are structural material, in which very little is doing as yet, and in rails. The steam railroads are holding back, and about the only contracts reported are for electric lines.

The Ore Association will hold another meeting this week, but there is very little expectation of an agreement. The general belief is that the ore market this season will be an open one. Shipments down the lakes will be delayed by ice, and it is not expected that cargoes will be deliverd at Lake Erie ports before the middle of May.

United States Steel Corporation.—The directors at their meeting held April 5 declared the regular quarterly dividend of 1¾% on the preferred stock, payable May 16. In a statement issued after the meeting the net earnings for the quarter ended March 31 were given at $13,208,886, the smallest in the history of the corporation. This is in the neighborhood of conservative estimates. Attention was called to the fact that the new system of reporting, which was outlined in the annual report, went into effect January 1.

The deficit after paying the preferred dividend for the quarter is $1,857,120. This compares with a deficit for the December quarter of $4,251,485. The smaller deficit for the past quarter is partly due to a reduction in allowances for and partly to the conversion of preferred stock into bonds. An interesting feature of the statement is the amount of orders on hand, which are placed at 4,136,961 tons, against 3,215,123 on December 31, 1903. This gain in the volume of orders represents the improvement in the conditions of the iron and steel trade.

The income account for the quarter is as follows, March earnings being estimated:

	1903.	1904.
Total net earnings	$24,656,136	$13,208,886
Deduct—		
For sinking funds	$1,055,000	$1,240,367
Deprec. and reserve funds	2,809,947	1,717,778
Interest	3,800,000	5,802,942
Total deductions	$7,664,947	$8,761,087
Balance	$16,991,189	$4,447,799
Dividend on stocks—		
Preferred (1¾%)	$8,929,919	$6,304,919
Common (1%)	5,083,025	.....
Total	$14,012,944	$6,304,919
Deficit	$2,978,245	$1,857,120

The following table shows the net earnings by months during the past quarter, with comparisons:

	1904.
January	$2,868,213
February	4,540,673
March (estimated)	5,800,000
Total	$13,208,886

In the same quarter a year ago the figures were $25,068,707 and two years ago $26,715,457. The net earnings in the December, 1903, quarter were $15,037,181.

Birmingham. April 4.

(From Our Special Correspondent.)

The pig iron market in the South is still very strong, though the buying is not as active as it was a fortnight ago. There are some sales still being made, though the $10 rate for No. 2 foundry checked the demand. Another advance in price and a 50c. increase is looked for during the coming week or ten days.

During the past week the Tennessee Coal, Iron & Railroad Company blew in No. 3 furnace at Ensley. This furnace should add from 175 to 225 tons of iron to the daily production. This week the Republic Iron & Steel Company will blow in No. 1 furnace at Thomas.

The following quotations are given: No. 1 foundry, $10.50; No. 2 foundry, $10; No. 3 foundry, $9.50@$9.75; No. 4 foundry, $9@$9.25; gray forge, $8.50@$9; No. 1 soft, $10.50; No. 2 soft, $10. Some of the iron manufacturers in the Southern territory are still out of the market entirely for No. 2 and No. 3 foundry and No. 2 soft and may remain out for two months to come.

Labor troubles at the Ensley steel plant of the Tennessee Co. disturbs activity at that place. The company has a number of orders on hand for steel rails, but labor in the open-hearth furnace department is dissatisfied and only two of the ten furnaces are working. Hence the production of the plant is not near what it could or should be. A number of men brought from Pennsylvania to take the places of the dissatisfied laborers have returned to their homes. Efforts are being made to settle all differences and it is believed that this will be accomplished in the near future.

Chicago. April 4.

(From Our Special Correspondent.)

Firmness characterizes the local market for pig iron, and the prospects are decidedly bullish. There has been no weakening of the price of last week, $10 Birmingham, for southern No. 2 iron, or $13.85 Chicago. The cut freight rate of 35c. under the established price of $3.85 on Southern has been abolished, and is not likely to be tried soon, under interstate commerce regulations. Northern is quoted at $14.50, for No. 2 and holds up well, with the probability of an advance.

The total sales for the week probably have not been so large as the total for the previous week, but there is no indication of a relapse toward the $9 Birmingham that marked the Southern minimum price here in the winter. Leading agents are by no means asured that the upward tone of the market is permanent, but all signs are that way. Users of iron are buying because they have to buy, and they must continue to buy. The relations of production and consumption are apparently on a safe basis again, through disappearance of surplus stocks. In Chicago three of the four furnaces making commercial iron are running—one of the International Harvester Co., and two of the Iroquois Iron Co., at South Chicago. Only one furnace, belonging to the International Harvester Co., is closed. The Thomas Mayville and Spring Valley furnaces are in blast again. Sales continue to be chiefly for the second and third quarters of the year.

Coke is firm at $4.90@$5.15 for 72-hour Connellsville, with no prospect of a slump. There is a large demand for spot coke, which commands 25c. premium.

Cleveland. April 5.

(From Our Special Correspondent.)

Iron Ore.—A meeting of the Ore Association is scheduled for New York for the latter part of this week. The discussion has been along the line of the impossibility of the members of the association to reach an agreement. A short season of navigation seems absolutely established beyond question. This time last year the boats were passing the Sault, but now the channels between the upper lakes are as tightly frozen as they usually are in the middle of winter. It is now said that the first cargoes of ore may be delayed until about the first or the middle of May before reaching the lower lake ports. This will give the shippers more to do in getting their material down the lakes. Meanwhile the increase in consumption promises a better market for the material. No sales of ore have been reported, all producers holding off until the price question is settled.

Finished Iron and Steel.—The opening of April finds something approaching a lull in business. The only development has been the selling of some railroad material, principally rails. These supplies have gone to the traction companies. The buying of structural seems to be a little better, but it is evident that the railroads have not yet started to cover their bridge contracts. The price holds at 1.60c. Pittsburg. In plates the situation has not changed. The price is still 1.60c Pittsburg. The buying of sheets has been a little better. The market is a little stiffer but is still not over buoyant. The smaller producers are not inclined to cut prices to get business. The market holds at 2.50c. for No. 27 black sheets out of stock; 2.25@2.30c, for one-pass cold rolled in car-lots at the mill, with No. 27 as the basis; 75, 10 and 5 off list for Nos. 16 to 20 and for No. 22 and lighter, 75, 10 and 7½ off list. The buying of bars has improved over last week. Bar steel holds at 1.35c. Pittsburg for bessemer, and 1.40c. Pittsburg for open-hearth. Bar iron holds at 1.35c. Pittsburg.

New York. April 6.

Pig Iron.—There is a fair demand for iron, but no eagerness to buy. We quote at tidewater as follows: No. 1 X foundry, $15.70; No. 2 X foundry, $15.20; No. 2 plain can be had for 50c. less; while gray forge is selling around $14.20. For Southern irons on dock quotations are: No. 1 foundry, $14.25; No. 2 foundry, $13.75; with lower grades in proportion. No. 1 soft can be had at about $14.25, and No. 2 soft at $13.50.

Bar Iron and Steel.—Buying is of fair volume, but the market is quiet. Refined bars are quoted at 1.45@1.50c., in large lots, with steel at 1.50c. Common iron bars can be had for 1.35c.

Plates.—There is little demand locally. Sheared plates are quoted as follows: Tank, 1¼-in. and heavier, 1.75@1.80c.; flange, 1.85@2.05c.; marine, 2.05@2.15c.

Steel Rails.—The quotations remain $28 for standard sections, f. o. b. mills. Light rails are quoted f. o. b. eastern Pennsylvania mills as follows: 12-lb., $27; 20-lb., 25-lb., 30-lb. and 35-lb., $25; 40-lb. and 45-lb., $24.

Philadelphia. April 6.

(From Our Special Correspondent.)

A remarkable change has burst over the pig iron market during the past few days. A large amount of business has been done in basic and bessemer especially. Prices have been advanced 25c. per ton, nominally at least, but it is claimed that most of the large business just closed was on the basis of quotations ruling during the progress of negotiations. There are a number of inquiries on the market to-day, especially for basic iron. The sudden demand for rolled iron has brought out quite a number of buyers of forge, and the business in this direction has been satisfactory. All three kinds of foundry iron have been selling better. The situation all through is decidedly better. There is also a good deal of inquiry for low phosphorus iron. Quotations may be given at $16 for No. 1 X, $15.25, for No. 2 X, $14.75 for No. 2 plain, $13.75 for standard forge and $14 for basic. Southern No. 2, rail shipment, can still be had at $14.50.

Billets.—Billets have nominally moved up 50c. per ton. Business has been done at $25.50, average quotation $25, but even better has been done on some large transactions.

Plates.—The plate mills are running along about as they have been for several weeks. The spring business has been somewhat disappointing. The usual quotations are 1.78½ for tank

steel; ¼-in. flange, 1.88½; fire-box, 1.98½ cents.

Structural Material.—The only business we are doing is confined to small lots, but the American Bridge Co. has secured a very large amount of business during the past few days. This has led to an order to resume work at the Lancoyd mills.

Old Rails.—Old rails are quoted at $19 for iron and $15.50 for steel.

Scrap.—Scrap is very strong. Machinery scrap was snapped up at $13.75. Considerable No. 2 light scrap sold at $12.50. Choice railroad scrap, which is not to be had, is quoted nominally at $18.50. A great deal of heavy steel scrap is now ordered and the dealers are scouring around after it.

Pittsburg. April 5.

(From Our Special Correspondent.)

The strength of the pig iron and steel billet markets has increased to such an extent during the past week that there is an actual scarcity. In several instances premiums have been secured on small lots of billets for early delivery. Pig iron prices are much firmer and a trifle higher, disappointing many consumers who had believed the recent advances were only temporary. The minimum price for bessemer pig iron is now $13.50, Valley furnaces, or $14.35, Pittsburg, and April delivery at that rate is not possible, according to several leading local interests. The largest sale of the week was made on Friday by a large Pittsburg furnace interest, which closed a contract for 10,000 tons at $13.50, Valley, for delivery in the second quarter. Foundry and gray forge prices are firmer this week. There is now no doubt that the United States Steel Corporation will exercise its options on 30,000 tons with the Bessemer Pig Iron Association and 15,000 tons with W. P. Snyder & Co., which expire on April 10. It is not at all probable that the Corporation will exercise its privilege of cancelling the unshipped portion of its orders placed last month. An idea of the confidence furnace-owners have in the future of the pig iron market may be taken from the following statement made by the representative of an interest that has a contract with the Corporation for iron at $13, Valley: "We would willingly cancel the order and pay the Corporation 25c. a ton for the privilege, as we can readily sell at $13.50, and most likely will get a higher price later." He also declared that talk of the Corporation cancelling unfilled orders at the end of each month, which it could do under the contract, was absurd. It is announced that the Clairton Steel Co. will be operating its group of three blast furnaces for the first time before the end of this week. No. 1 furnace was blown in on April 21 last and No. 2 went in about two months later. No. 3 was practically completed late last year, but has never been operated. No. 1 has been out of blast for about four months and is to be blown in to-morrow, and No. 3 is to be put in blast in a few days. The three furnaces will produce from 1,300 to 1,400 tons daily. It is believed in some quarters here that higher prices for pig iron will be checked if the ore interests do not get together. The meeting scheduled for April 1 has been postponed until April 7. If the producers fail to reach an agreement, it will mean the disruption of the association and an open market on ore would likely have an effect on pig iron prices.

The improvement in the steel market is more noticeable this week. The order for 1,000 steel cars, placed by the Pittsburg & Lake Erie with the Pressed Steel Car Co., already noted, was followed by a contract for 1,125 cars, placed by the Pennsylvania with the Standard Steel Car Co., and an order for 1,000 cars with the American Car & Foundry Co. As 10 tons of steel plates are required for a car, the orders for steel cars will mean specifications for more than 20,000 tons of steel plates.

The Amalgamated Association of Iron, Steel & Tin Workers is facing a serious crisis. When the ballots of the members of the sheet and tin-plate lodges on the reduction in the wage scale accepted by the general executive board were counted on Saturday, it was found that the proposition had been defeated. Under the conditions which the revised scale went into force it was annulled on April 2 by the vote, and a strike for the original scale should have been ordered. Instead the board decided to call a conference of the lodges in the sheet and tin-plate branches, and it will open in Pittsburg to-morrow. In the meantime the members were ordered to continue at work.

Pig Iron.—Sales of bessemer pig iron during the week amounted to about 15,000 tons, one contract being for 10,000 tons at $13.50, Valley furnace. Several sales of foundry No. 2 have been made and less than $14, Pittsburg, cannot be done. Gray forge is firmer, and one or two small sales are noted at $13.85, Pittsburg; this is now believed to be the minimum price.

Steel.—A number of sales of bessemer billets and sheet-bars have been made at the pool price or at premiums for prompt shipment. The pool prices are firm at $23 for bessemer and open-hearth billets and $1 extra for sheet-bars. The Billet Association will meet on April 14, but no change in prices is expected. Bessemer steel bars are active at 1.35c. and plates are firm at 1.60c. A meeting of the Plate Association is scheduled for Thursday, and it is likely that meetings of the structural and steel rail interests also will be held this week.

Sheets.—There seems to be a trifling improvement in the sheet market. Nominal quotations remain at 2.30c. for black and 3.30c. for galvanized No. 28 gauge.

Ferro-manganese.—Sales of domestic 80% have been made at $42.50@$43 per ton.

Cartagena, Spain. Mar. 19.

(Special Report of Barrington & Holt.)

Iron and Manganiferous Ores.—Shipments reported include one cargo, 2,300 tons dry ore, to Great Britain. Business continues fair, and several new contracts are reported for future delivery. These include some with German buyers; also a quantity of ore for shipment to Sydney, Cape Breton.

Current quotations for iron ore are: Ordinary 50% ore, 6s. 6d.@6s. 9d.; special low phosphorus, 7s.@7s. 6d.; specular ore, 58% iron, 9s.; magnetic ore, 60%, 11s. 3d for lumps and 9s. 3d. for smalls. Manganiferous ores range from 14s. 3d. for 20% iron and 20% manganese down to 9s. 6d. for 35% iron and 12% manganese.

CHEMICALS AND MINERALS.

New York, April 6.

As spring advances trade improves, but the prolonged wintry weather has congested traffic so as to make deliveries this year appear rather unfavorable as compared with 1903. This situation, however, will be changed during the next few months, when it is thought shipments will be very heavy. Financially, the trade is in better form, because sellers are not disposed to throw away their goods at low prices. From all appearances speculative buying is decreasing.

Attention is being given in Utah to the utilization of the salt from the Great Salt lake for the manufacture of soda ash and kindred products. The Utah Salt & Soda Co. and the Inland Crystal Salt Co. are both planning to erect works. They will use electrolytic processes.

Apparently the troubles of the potash syndicate are to be experienced by the German salt trust, known as the North German Salt Assotiation, unless the Prussian mining officials acquiesce in an advance in prices and a reduction in the individual production to permit the entrance of the Benthe works, near Hanover, which are responsible for aggressive competition. The Prussian Minister of Commerce, it is reported, has refused to grant the petition referred to, particularly that which would cut the production and interfere with the employment of the Government workmen.

Cyanide.—Several small arrivals are noted from Great Britain, and among them is one of 50 cases from the United Alkali Co. New York quotations are 19@20c. per pound.

Copper Sulphate.—Transient buyers are asked to pay $5.20@5.25 per 100 lb. now, owing to the limited stocks in makers' hands and the improved export trade.

Bleaching Powder.—Contract deliveries are slightly better. Importers ask $1.20@$1.25 per 100 lb. for prime Continental, and $1.25 for British and American brands.

Acids.—Firm, and contract deliveries are moving more freely.

We quote as below per 100 lb., unless otherwise specified, for large lots in carboys or bulk (in tank cars), delivered in New York and vicinity:

Muriatic, 18°	$1.50	Oxalic, com'l.	$5.10@$5.50
Muriatic, 20°	1.60	Sulphuric, 50°, bulk, ton	13.50@14.50
Muriatic, 22°	1.75	Sulphuric, 60°	1.05
Nitric, 36°	4.50	bulk, ton	18.00@20.00
Nitric, 38°	4.75	Sulphuric, 66°	1.20
Nitric, 40°	5.00	bulk, ton	21.00@23.00
Nitric, 42°	5.50		

Brimstone.—Small lots of best unmixed seconds have sold ex-steamer at $22.50@$22.75 per ton, while shipments are quoted at $21.75@$22. Best thirds are nominally 75c. less than seconds.

Pyrites.—Business is fair at unchanged prices. We quote domestic pyrites $5 per ton for lump ore f. o. b. Atlantic coast mines, and 9c. per unit for fines; sulphur content varies from 42@44%. Spanish pyrites, carrying from 46@52% sulphur, are quoted at 11@11.5c. per unit for lump, and 9.5@10c. for fines, delivered at Atlantic ports.

Nitrate of Soda.—The spot market is particularly strong owing to variable winds on the coast which have detained vessels. It is expected that nitrate of soda will continue scarce for the next 60 days. Holders of spot ask $2.25 per 100 lb., which is also quoted for arrivals into May. Futures retain their firmness, being influenced partly by higher ocean freight rates. June cargoes are worth $2.15, July to December, $2.125.

Expansion is noticeable in the recovery of wood alcohol, acetate of lime and other useful by-products from charcoal. In Michigan the Cleveland Cliffs Iron Co. has a large plant at its Pioneer Furnace, and now the Burrell Chemical Co., operating a furnace at Newberry, contemplates the erection of another chemical plant. Last year there were exported from the United states 61,444,947 lb. acetate of lime, principally to Germany, which is an increase over previous years.

Messrs. Mortimer & Wisner's monthly statement of nitrate of soda, dated New York, April 1, gives the following interesting statistics, in tons:

	1904.	1903.
Imported into Atlantic ports from West Coast S. A. from Jan. 1, 1904, to date	81,161	49,485
Total	81,161	49,485
Stock in store and afloat April 1, 1904, in New York	1,900	1,000
Philadelphia	5,000	.....
Baltimore	300	2,500
Charleston	2,400	.....
To arrive, due July 15, 1904	62,300	73,000
Visible supply to July 15, 1904	71,900	76,500
Stock on hand Jan. 1	8,100	7,800
Deliveries past month	27,201	16,952
Deliveries since Jan. 1 to date	79,661	53,785
Total yearly deliveries	....	229,589
Prices current, April	2.17½c.	2.10c.

Deliveries this year show a substantial increase.

Sulphate of Ammonia.—Uninterestingly quiet at present. Gas liquor is quoted at $3.15@$3.175 per 100 lb., though some sellers ask up to $3.20, but there is no forced demand to encourage a sale at this price. In February Great Britain exported 31,798 long tons sulphate of ammonia, of which 776 tons were for America.

Phosphates.—Perhaps the most gratifying feature of the industry is the increase in exports to markets in competiton with foreign phosphates. Germany buys the larger part of the hard rock; France, the land pebble. For the two months ending February 29, Florida shipments, in long tons, were:

	Export.	Domestic.	Total 1904.	Total 1903.
Hard rock	57,161	.....	57,161	37,527
Land pebble	43,520	23,629	67,149	24,355
Peace River pebble	....	12,695	12,695	.....
Total	100,681	36,324	137,005	61,882

The total increase in this year's shipments is 75,123 tons, of which considerably over half was in land pebble.

Exports of Tennessee rock through Pensacola in the two months ending February 29 were 13,899 tons, principally to Italy, which is an improvement over 1903.

The Central Phosphate Mining Co. recently applied to the South Carolina State phosphate commissioners for the exclusive right to mine and ship mineral from about 3,000 acres of marsh land on Morgan's, Coosaw and Buzzard

islands. The commissioners in acquiescing, fixed the royalty for the first year at 5c. per ton; second year, 15c., and third year, 25c., the period asked for the privilege. In granting the petition, the commissioners retain the authority to revoke the license should the phosphate company violate the stipulations made.

Ocean freight rates are about as follows, per ton:

	Shipping ports		
	Florida.	So. Carolina.	Africa.
Continental.	2.76@ 3.00	....	1.80@ 2.22
Baltic.	$3.46@$3.74	$2.26	2.18
Mediterranean	3.36@ 3.60	....	1.80
United Kingdom..	2.64@ 3.12	2.56@ 2.64	1.86@ 2.04

Prices for phosphates are as follows per ton:

Phosphates.	F. o. b.	C. i. f. Gt. Britain or Europe.
*Fla. hard rock, 77@80%	$6.50@ 7.00	$9.84@$10.83
land pebble, 68@73%	3.75@ 4.00	7.35@ 8.05
†Tenn, 78@80%	4.00@ 4.25	9.54@ 10.56
78%	3.75@ 4.00	.....
75%	3.25@ 3.50	.....
73@74%	2.95@ 3.20	.....
‡So. Car. land rock	3.25	.....
river rock, 55@60%.	2.75@ 3.00	5.61@ 6.04
Algerian 63@70%	.....	6.82@ 7.32
58@63%	.....	6.05@ 6.50
53@58%	.....	4.95@ 5.09
Tunis (Gafsa)	.....	5.75@ 6.50
Christmas Isle, 80@85%	.....	11.75@ 12.54
Ocean Isle, 82@88%	.....	12.54@ 12.98
Somme, Fr., 70@75%	.....	10.63@ 11.02
Bordeaux, Fr., 60@65%	.....	7.60@ 7.72
55@60%	.....	6.44@ 6.55
Liege, Bel., 60@65%	.....	7.00@ 7.10

* F. o. b. Florida or Georgia ports. † F. o. b. Mt. Pleasant. ‡On vessel, Ashley River, S. C.

Liverpool. Mar. 23.

(Special Report of Joseph P. Brunner & Co.)

There is no activity in the ordinary heavy chemicals, but prices are very steady.

Soda ash is moving off steadily, For tierces, nearest spot range is about as follows: Leblanc ash, 48%, £5@£5 10s.; 58%, £5 10s.@£6 per ton net cash. Ammonia ash, 48%, £4 5s@£4 10s.; 58%, £4 10s.@£4 15s. net cash; bags, 5s. per ton under price for tierces. Soda crystals are in fair jobbing request at generally £3 7s. 6d. per ton, less 5% for barrels or 7s. less for bags, with special terms for a few favored markets. Caustic soda is in moderate demand at firm prices. We quote: 60%, £8 15s.; 70%, £9 15s.; 74%, £10 5s.; 76%, £10 10s. per ton net cash. Special quotations for export to the Continent and a few other export quarters. Bleaching powder is dull, and for hardwood quotations are £4 5s.@£4 15s. per ton net cash, as to market.

METAL MARKET.

New York, April 6.

Gold and Silver Exports and Imports,

At all United States Ports in February and Year.

Metal	February.		Year.	
	1903.	1904.	1903.	1904.
Gold:				
Exports.	$1,506,370	$732,614	$1,592,321	$1,324,181
Imports.	1,817,456	5,030,372	3,828,307	13,255,880
Excess	I. $311,086	I. $4,297,758	I. $2,235,986	I. $11,931,699
Silver:				
Exports.	3,866,514	3,801,869	7,444,395	8,419,996
Imports.	1,687,007	2,110,675	3,181,563	4,720,047
Excess	E. $2,179,507	E. $1,691,194	E. $4,262,832	E. $3,699,949

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, New York.

For the week ending March 26 and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$5,000	$25,665	$909,750	$5,755
1904	1,927,160	1,533,704	12,202,640	177,580
1903	1,291,151	2,500,879	5,314,840	336,197
1902	13,851,695	846,541	9,488,299	353,436

The gold movement was chiefly with Central America and the West Indies; the silver with Great Britain.

General business continues rather quiet, although there is a definite improvement in several manufacturing lines. Foreign exchange continues high. Early this week one engagement of $600,000 gold was made for export to Paris. Besides this, a shipment of $250,000 was made to Buenos Ayres, on British account.

The statement of the New York banks—including the 56 banks represented in the Clearing House—for the week ending April 2, gives the following totals, comparisons being made with the corresponding week of 1903:

	1903.	1904.
Loans and discounts	$903,984,900	$1,022,707,100
Deposits	888,762,300	1,069,369,400
Circulation	42,970,700	36,880,000
Specie	158,146,200	223,390,100
Legal tenders	66,175,200	71,707,300
Total reserve	$224,321,400	$295,097,400
Legal requirements	222,190,575	267,342,350
Balance surplus	$2,130,825	$27,755,050

Changes for the week this year were increases of $14,843,400 in loans and discounts, $20,700,900 in deposits, $5,663,000 in specie, and $286,175 in surplus reserve; decreases of $56,000 in circulation, and $201,600 in legal tenders.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars and comparison is made with the holdings at the corresponding date last year:

	1903.		1904.	
	Gold.	Silver.	Gold.	Silver.
N. Y. Ass'd—	$158,146,200	.....	$223,390,100	.....
England—	180,990,130	.....	170,294,260	.....
France—	502,645,800	$219,816,870	472,517,700	$222,899,740
Germany—	151,420,000	53,200,000	180,820,000	63,530,000
Spain—	72,295,000	101,150,000	73,180,000	98,540,000
Netherlands—	19,687,000	33,263,000	27,212,500	33,534,500
Belgium—	15,563,335	7,781,665	15,570,000	7,785,000
Italy—	87,795,000	16,366,500	110,300,000	19,016,000
Russia—	397,065,000	42,375,000	447,885,000	42,095,000
Austria—	231,030,00	64,840,000	236,855,000	64,525,000

The returns of the Associated Banks of New York are of date of April 2, and the others March 31, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The coinage executed at the mints of the United States in March is reported as below by the Bureau of the Mint, Treasury Department:

Denomination.	Pieces.	Value.
Double eagles	3,180,247	$63,604,940.00
Eagles	47	470.00
Half eagles	43	215.00
Quar. eagles	66	165.00
Total gold	3,180,403	$63,605,790.00
Dollars	1,200,275	1,200,275.00
Half-dollars	116,275	58,137.50
Quar.-dollars	532,275	133,068.75
Dimes	1,000,275	100,027.50
Total silver	2,849,100	$1,491,508.75
Five-c., nickels	1,802,000	90,100.00
One-c., bronze	7,477,000	74,770.00
Total minor	9,279,000	$164,870.00
Total coinage	15,308,503	$65,262,168.75
January	11,739,000	7,518,780.00
February	4,383,510	37,100,850.00
Grand Total	31,431,013	$109,881,798.75

In addition to the above there were coined for the Philippines in March, 496 pesos; 495 50c.; 496 20c.; 496 10c.; 495 5c.; 495 1c., and 495 ½c.; total, 3,469 pieces.

The Treasury Department's estimate of the money in the United States on April 1 is as follows:

	Total.	In Treasury.	In circulation.
Gold coin (inc. bul. in Tr'y)	$1,348,803,970	$248,529,691	$650,924,710
Gold Ctfs.	.....	.....	449,349,569
Silver Dollars	557,559,484	16,798,224	74,709,181
Silver Ctfs.	.....	.....	466,052,079
Subsid. Silver	106,633,724	11,545,932	95,087,792
Treasury Notes of 1890	14,372,000	57,324	14,314,676
U. S. Notes	346,681,016	5,273,146	341,407,870
Currency Ctfs.	.....	.....	.....
Nat. Bk. Notes	434,909,942	10,116,596	424,793,346
Total	$2,808,960,136	$292,320,913	$2,516,639,223

Population of the United States April 1, 1904, estimated at 81,522,000; circulation per capita, $30.87. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury, and is not included in the amount of money held as assets of the Government. This statement of money held in the Treasury as assets of the Government does not include deposits of public money in national bank depositaries, to the credit of the Treasury of the United States, and amounting to $154,288,210. The total amount in circulation shows an increase of $13,157,326 on March 1, and an increase of $164,881,280 over April 1, 1903.

The silver market has been very limited. Offers have been in excess of demand, and while there has been no special pressure to sell, the inquiry has not been sufficient to maintain the price. The result is a gradual weakening in quotations to 25¼c. to-day.

The United States Assay office in New York reports receipts of 61,000 oz. silver for the week.

Shipments of silver from London to the East for the year up to March 24 are reported by Messrs. Pixley & Abell's circular as follows:

	1903.	1904.	Changes.
India	£1,968,200	£3,238,839	I. £1,270,639
China	106,500	71,000	D. 35,500
Straits	128,491	58,103	D. 70,388
Total	£2,203,191	£3,367,942	I. £1,164,751

Receipts for the week this year were £164,000 in bar silver from New York, £4,000 from the West Indies, and £4,000 from Australia; total, £172,000. Shipments were £43,800 in bar silver to Bombay, and £5,000 to Madras; total, £48,800.

Indian exchange has stiffened up a little, and the 60 lakhs of Council bills offered in London were all taken at an average of 16.03d. per rupee. There has been but little demand for silver on Indian account and very little remittance in that form.

The movement of gold and silver in France for the two months ending February 29, is reported by the Ministry of Commerce as follows:

Gold.	1903.	1904.	Changes.
Imports	Fr. 57,954,000	Fr. 49,659,000	D. Fr. 8,295,000
Exports	9,719,000	24,946,000	I. 15,227,000
Excess imp.	48,235,000	24,713,000	D. 23,522,000
Silver:			
Imports	11,928,000	19,750,000	I. 7,822,000
Exports	10,686,000	31,698,000	I. 21,012,000
Excess	I. 1,242,000	E. 11,948,000	.....

Imports of copper and nickel coins, rated at their face value, were 14,000fr. in 1903, and 15,000fr. in 1904; exports were 60,000fr. in 1903, and 122,000fr. this year.

Prices of Foreign Coins.

	Bid.	Asked
Mexican dollars	$0.44	$0.47½
Peruvian soles and Chinese pesos	.40	.45
Victoria sovereigns	4.85½	4.87
Twenty francs	3.85	3.87
Spanish 25 pesetas	4.78	4.82

OTHER METALS.

Daily Prices of Metals in New York.

March-Apr.	Silver—New York, Cts.	Silver—London, Pence.	Copper—Lake, Cts. per lb.	Copper—Electrolytic, Cts. per lb.	Copper—London, £ per ton.	Tin, Cts. per lb.	Lead, Cts. per lb.	Spelter—N. Y., Cts. per lb.	Spelter—[illegible], Cts. per lb.
31	55¼	25⅛	12⅞ @13	12⅝ @12⅞	58⅛	28¼	4.45 @4.50	5.20	5.00
1	55¼	....	12⅞ @13⅛	12⅝ @12⅞	....	28¼	4.45 @4.50	5.20	5.00
2	55⅛	25⅞	13 @13¼	12¾ @13	....	28¼	4.45 @4.50	5.20	5.00
4	55⅛	....	13 @13¼	12¾ @13	...	28¼	4.45 @4.50	5.20	5.00
5	55¼	25⅛	13 @13⅛	12¾ @13	58⅛	28½	4.45 @4.50	5.20	5.00
6	54⅝	25¼	13 @13¼	12⅞ @13	58⅝	28¼	4.45 @4.50	5.20	5.00

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wire-bars: the price of electrolytic cathodes is usually 0.25c. lower than these figures.

QUOTATIONS ON STERLING EXCHANGE.

March 31.....	4.87¼	April 3.....	4.87¼
April 1.....	4.87¼	" 4.....	4.87¼
" 2.....	4.87¼	" 6.....	4.8720

Copper.—During the week under review, the market has again developed considerable strength, and prices show a further advance. Quite a fair business has been transacted for home trade, while exports continue large, those for the month of March amounting to 20,675 tons. The closing quotations are given as 13@13¼ for Lake; 12⅞@13c. for electrolytic in cakes, wire-bars and ingots, 12⅝@12¾ for cathodes; 12½@12⅝ for casting copper.

In Europe, business was interrupted owing to the Easter holidays. The market for standard copper in London, which closed last Thursday at £58 2s. 6d., opened on Tuesday at £58 10s., and the closing quotations on Wednesday are cabled as £58 12s. 6d.@£58 13s. 9d. for spot, £58 7s. 6d.@£58 8s. 9d. for three months.

Statistics for the second half of March show a decrease in the visible supplies of 200 tons.

Refined and manufactured sorts we quote: English tough, £61 15s.@£62; best selected, £62 5s.@£62 10s.; strong sheets, £72 10s.@£72 15s.; India sheets, £70 10s.@£70 15s.; yellow metal, 6⅜@6½d.

Exports of copper from Atlantic ports in the week ending April 5 were 2,873 tons, principally to France and Germany. Imports were 401 tons from Great Britain and 459 tons from Mexico, a total of 860 tons.

Tin.—The market has been void of any special feature, consumers only covering their immediate requirements. Prices have ruled steady at about 28¼ for spot, 28c. for futures.

The foreign market, which closed last Thursday at £127 15s. opened on Tuesday at £128 7s. 6d., and the closing quotations on Wednesday are cabled as £127 7s. 6d.@£127 8s. 9d. for spot, £127 10s.@£127 11s. 3d. for three months.

Statistics for the month of March show an increase in the visible supplies of 400 tons.

Lead is quiet but steady, without any special feature. The closing quotations are given as 4.45@4.50 New York, 4.37½@4.42½ St. Louis.

The foreign market, which had been rather easy last week, has grown firmer during the last few days, Spanish lead being quoted at £12 6s. 3d., English at £12 8s. 9d.

St. Louis Lead Market.—The John Wahl Commission Company telegraphs us as follows: Lead is strong but quiet, selling at 4.42½c. for both soft Missouri and argentiferous.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 19, that heavy sales have been made, one mine contracting for 60,000 quintals of high-grade ore. Shipments included 1,250 tons blende to Swansea, 12,400 tons blende and calamine to Stettin. The last named shipment to Germany is something new, little Spanish ore having been shipped to that country heretofore. Quotations are 65 fr. per ton for blende, 35%, and 45 fr. for calamine, 30% zinc.

Spelter.—In view of the high price asked for ore, values for spelter are also well maintained. Quite a satisfactory demand is reported. The closing quotations are unchanged at 5c. St. Louis, 5.20 New York.

The foreign market is strong, good ordinaries being quoted at £22 5s., specials at £22 10s.

St. Louis Spelter Market.—The John Wahl Commission Company telegraphs us as follows: Spelter is strong and advancing. The latest sale reported has been on the basis of 5@5.05c., East St. Louis.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 19, that the price of silver during the week has been 14.50 reales per oz. Exchange is 27.93 pesetas to £1. Local quotation for pig lead on wharf has been 67.75 reales per quintal, which, on current exchange, is equal to £10 17s. per long ton, f. o. b. Cartagena. Shipments included 223,392 kg. to Marseilles and 300,000 kg. delivered to Bristol.

Antimony is quiet but steady. The ruling quotations are: Cookson's, 7¾@8c.; Hallett's 6⅝@6⅞; U. S., Italian, Hungarian, French, Japanese and Chinese, 6⅜@6½ cents.

Nickel.—The price is quoted by leading producers at 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots, according to quantity, runs as high as 60c. per lb.

Platinum.—Demand continues steady, and the price is firm at $18.50 per oz.

Messrs. Eimer & Amend, of New York, quote prices for platinum in manufactured forms, as follows: Heavy sheet and rod, 72c. per gram; foil and wire, 75c. per gram; platinum crucibles and dishes, 77c. per gram; perforated wire, like cones, Gooch crucibles, etc., 82c. per gram.

Quicksilver.—The New York price is $45 per flask for large lots, while a slightly higher figure is quoted for smaller orders. The San Francisco quotations continue at $44@$45 per flask for domestic orders, and about $41.50 for export. The London price is £8 5s. per flask, with the same quotation asked by second hands.

Cadmium.—According to Herr Paul Speier, metallic cadmium is in good demand. Metal containing 95.5% cadmium sells at 700 marks per 100 kg., delivered in Berlin or Hamburg.

Minor Metals and Alloys.—Wholesale prices, f. o. b. works, are as follows:

	Per lb		Per lb
Aluminum		Ferro-Tungsten (37%)	38c.
No. 1. 99% ingots	33@37c.	Magnesium, pure (N. Y.)	60c.
No. 2. 90% ingots	31@34c.	Manganese	$2.75
Rolled Sheets	4c. up	Mangan'e Cop. (20% Mn)	32c.
Alum-bronze	20@23c.	Mangan'e Cop. (30% Mn)	38c.
Nickel-alum	33@39c.	Molybdenum (Best)	$2.00
Bismuth	$2.10	Phosphorus, foreign	45c.
Chromium, pure (N. Y.)	80c.	Phosphorus, American	70c.
Copper, red oxide	50c.	Sodium metal	50c
Ferro-Molybde'm (50%)	$1.25	Tungsten (Best)	88c.
Ferro-Titanium (10%)	90c.		
Ferro-Titanium (20@25%) N. Y.	55c.		

Variations in price depend chiefly on size of order.

Missouri Ore Market. April 2.

(From Our Special Correspondent.)

The zinc market continues in the same tense condition relative to prices, with every purchasing agent anxious to load all ore it is possible to obtain, without advancing the market. The highest price of the week was $39 per ton for the best ore sold, several bins of choice ore being held because the buyers do not offer enough and because the holders believe it will be higher before it is any lower.

The lead market is as strong as ever, with the local smelters active for the best bins of ore. Following are the sales for the week:

	Zinc, lb.	Lead, lb.	Values.
Joplin	2,513,530	309,240	$54,210
Webb City-Carterville	2,424,050	426,350	51,150
Duenweg	1,075,140	167,350	23,350
Galena-Empire	959,600	169,900	20,260
Alba-Neck	712,720	.....	12,830
Badger	490,740	2,550	8,395
Carthage	411,990	.....	7,415
Aurora	351,640	10,770	5,410
Granby	320,000	55,000	4,800
Prosperity	252,160	5,190	4,560
Zincite	201,730	6,000	3,800
Central City	124,990	11,750	2,215
Carl Junction	102,210	.....	1,840
Beef Branch	47,610	61,700	1,785
Oronogo	98,410	4,800	1,710
Cave Springs	66,860	18,750	1,650
Spurgeon	21,260	10,500	420
Totals	10,174,640	1,259,850	$206,800
14 weeks	141,182,950	17,840,070	$2,848,105
Zinc value, the week	$170,600; 14 weeks		$2,350,315
Lead value, the week	36,200; 14 weeks		497,790

Outputting is strong, but has been less for a couple of weeks; the long, steady run of the latter part of the winter and early spring, owing to exceptionally fine weather, has put many plants in a condition for repairs. Within two weeks almost every mill in the district, that has been running for some time, has been idle from two to six days for one thing or another, and then there is a noticeable scarcity of expert miners.

Average Prices of Metals per lb., New York.

Mo.	Tin.		Lead.		Spelter.	
	1903	1904.	1903.	1904.	1903.	1904.
Jan...	28.33	28.845	4.075	4.347	4.865	4.863
Feb..	29.43	28.087	4.075	4.375	5.043	4.916
Mar..	30.15	28.317	4.442	4.475	5.349	5.057
April.	29.81	.....	4.567	.....	5.550	....
May .	29.51	.....	4.325	.....	5.639	....
June .	28.34	.....	4.210	.....	5.697	....
July..	27.68	.....	4.075	.....	5.662	....
Aug..	28.29	.....	4.075	.....	5.725	....
Sept..	26.77	.....	4.243	.....	5.686	....
Oct...	25.92	.....	4.375	.....	5.510	....
Nov..	25.42	.....	4.218	.....	5.038	....
Dec...	27.41	.....	4.162	.....	4.731	....
Year	28.09	.....	4.237	.....	5.400	....

NOTE.—The average price of spelter in St. Louis for the month of January, 1904, was 4.673c. per lb.; February, 4.717c.; March, 4.841c.

Average Prices of Copper.

Mo.	New York.				London.	
	Electrolytic.		Lake.		Standard.	
	1903.	1904.	1903.	1904.	1903.	1904.
Jan...	12.159	12.410	12.361	12.553	53.52	57.55
Feb...	12.778	12.063	12.901	12.245	57.34	56.57
Mar..	14.416	12.299	14.572	12.551	63.85	57.321
April.	14.454	.....	14.642	.....	61.72	.....
May..	14.435	.....	14.618	.....	61.73	.....
June .	13.942	.....	14.212	.....	57.30	.....
July..	13.094	.....	13.341	.....	56.64	.....
Aug..	12.962	.....	13.159	.....	58.44	.....
Sept..	13.205	.....	13.345	.....	56.82	.....
Oct...	12.801	.....	12.954	.....	55 60	.....
Nov..	12.617	.....	12.813	.....	56.30	.....
Dec. .	11.952	.....	12,084	.....	56.76	.....
Year	13.235	.....	13.417	.....	57.97	.....

New York prices are in cents, per pound; London prices in pounds sterling, per long ton of 2,240 lbs., standard copper. The prices for electrolytic copper are for cakes, ingots or wire bars: prices of cathodes are usually 0.25 cent lower.

Average Prices of Silver, per ounce Troy.

Mo.	1902.		1903.		1904.	
	London. Pence.	N. Y., Cents.	London Pence.	N. Y., Cents.	London, Pence.	N. Y., Cents.
Jan. .	25.62	55.56	21.98	45.57	26 423	57.055
Feb. .	25.41	55.09	22.11	47.89	26.665	57.592
Mar. .	25.00	54.23	22.49	48.72	26,164	56,741
April.	24.34	52.72	23.38	50.56	.....	.....
May. .	23.71	51.31	24.89	54.11	.....	.....
June .	24.17	52.36	24.29	52.86	.....	.....
July..	24.38	52.88	24.86	53.92	.....	.....
Aug. .	24.23	52.52	25.63	55.36	.....	.....
Sept..	23.88	51.52	26.75	58.00	.....	.....
Oct...	23.40	50.57	27.89	60.36	.....	.....
Nov. .	22.70	49.07	27.01	58.11	.....	.....
Dec...	22.21	48.03	25.73	55.375	.....	.....
Year	24.09	52.16	24.75	53.45	.....	.....

The New York prices are per fine ounce; the London quotation is per standard ounce. .925 fine.

DIVIDENDS.

Company.	Latest Dividend. Payable.	Rate.	Total.	Total to date.
†Am. S. & R., com.	Apr. 20	1.25	$625,000	$1,250,000
†Cent. C. & C., com.	Apr. 15	1.50	76,875	705,000
†Central C. & C., pf.	Apr. 15	1.25	23,437	843,746
*Imperial Oil, Cal.	Apr. 6	.20	20,000	580,000
Mary McKinney, Col.	Apr. 10	.03	30,000	590,000
Montana Ore Purch.	Apr. 30	4.00	324,000	3,618,000
*Peerless Oil, Cal.	Apr. 1	.14	12,880	241,920
‡Penna. Salt	Apr. 15	3.00	180,000	13,630.000
†Phil. N. Gas, com.	May 2	.75	231,486	3,879,643
Quilp, Wash.	Apr. 15	.01	15,000	15,000
†Tenn. C. & I., pf.	May 2	2.00	4,960	317,024
Thirty-three Oil	Apr. 6	.10	10,000	280,000
†U. S. Steel, pf.	May 16	1.75	6,305,497	105,487,897
†Va.-Car. Chem., pf.	Apr. 15	2.00	240,000	7,500,869

* Monthly. † Quarterly. ‡ Semi-annually.

ASSESSMENTS.

Company.	Delinquent.	Sale.	Amount.
Ancient Channel, Cal.	Apr. 20	.....	$0.05
Belcher, Nev.	Apr. 13	May 5	.10
Chollar, Nev.	Apr. 12	May 3	.10
Confidence, Nev.	Apr. 20	May 11	.20
Con. Imperial, Nev.	Apr. 14	May 9	01
Crown Point, Nev.	Apr. 27	May 18	.10
Exchequer, Nev.	Apr. 11	May 2	.05
Jubilee, Cal.	Apr. 18	.....	.05
Julia Con., Nev.	Apr. 13	May 3	.03
Justice, Nev.	Apr. 22	May 11	.10
Overman, Nev.	Apr. 12	May 3	.10
Little Chief, Utah	Apr. 20	May 11	.01
Union Con., Nev.	Apr. 19	May 9	.15
White Pine Copper, Nev.	Apr. 16	.....	.05

STOCK QUOTATIONS

NEW YORK.

Company.	Par val.	Mar. 30 H.	Mar. 30 L.	Mar. 31 H.	Mar. 31 L.	Apr. 1* H.	Apr. 1* L.	Apr. 2 H.	Apr. 2 L.	Apr. 3 H.	Apr. 3 L.	Apr. 4 H.	Apr. 4 L.	Sales.
Acacia	$1	06												1,000
Amalgamated, c	100	50½	49⅝	49¾	48⅞			50	49¼	49⅝	48¼	50⅝	48⅞	126,320
Anaconda, c	25									67		70	67	1,800
Andes, s	1	50												200
Belcher, s	3			28	27									300
Best & Belcher, s	3													
Breese, s. l	25									10				500
Bullion, s	1							11						100
Caledonia, s	1									1.30				
Challenge, s	2½													
Chollar, s., g	2½													
C. K. & N., g	1							20						500
Confidence	3													
Con.Cal.&Va., g.s.	2½	1.80	1.75					1.60				1.75		400
Con. Imperial, s	1											04		1,000
Creede &C. Ck., g	1			02½										1,000
Cripple Creek, g	1													
Crown Point	2½													
Daly, g. s	20	1.90												15
Elkton, g	1											66	65	700
El Paso, g	1									76				1,000
Gold Dollar, g	1			05								03	05	1,600
Gould & Curry	1	45		45				45	44					900
Greene Con., c	10	12⅛	12¼	12⅜	12¼			12¾	12⅜	13⅞	12¾	14	13⅞	9,945
Hale & Norcross	3	83		88						88				500
Homestake, g	100													
Horn Silver	20													
Isabella, g	1									29		31	30	1,500
Jack Pot, g	1	08												500
Julia, s	1	05												100
Little Chief, g. s	50													
Mexican, s	3	2.35		2.40						2.55		2.40		650
Mollie Gibson, g	5			06	05					06				2,500
Moon Anchor, q	5													
Moulton, g	25													
Occidental, s	3	85												100
Ontario, s. l	100											4.75		30
Ophir, s	3							6.00				5.62½		200
Overman, s	2	30								25				600
Pharmacist, g	1	03								03				1,500
Phœnix, g	1	08												400
Portland, g	1			1.75								1.85		100
Potosi, s	1							26	25	26				420
Quicksilver, Pf	100											5.00		50
Savage, s	3			64										100
Sierra Nevada, s	3	68	67							83	82	75	74	1,200
Silver Hill, g. s	10			69										100
StandardCon., g. s	25									2.65		2.75	2.65	1,300
Tennessee, c	1													
Union Con., g. s	10							05				90		400
Union Copper	100	⅝						⅝				¾	⅝	2,260
United, com., c														
Vindicator								02						500
White Knob, c	10											8½		100
Work, g	1							07						1,000
Yellow Jacket, s	3											30		100

c—Copper. g—Gold. l—Lead. s—Silver. Total sales, 163,090 shares. *Holiday.

BOSTON, MASS.

Company.	Par val	Mar. 30 H.	Mar. 30 L.	Mar. 31 H.	Mar. 31 L.	Apr. 1* H.	Apr. 1* L.	Apr. 2 H.	Apr. 2 L.	Apr. 4 H.	Apr. 4 L.	Apr. 5 H.	Apr. 5 L.	Sales
AdventureCon., c	$25			2⅛								2⅛		130
Aetna q														
Allouez, c	25	5	4½	4⅛	4⅛			4⅛	4⅜	4⅜	4⅛	5⅜	4⅛	4,084
Amalgamated, c	100	50¼	49½	49⅝	49			49¼	49¼	49½	48½	50⅝	48⅜	17,206
Am. Gold Dredg	5													
Am. Z., L. & Sm	25			10	9¾			11	10½	11	10⅞	11¼	10½	2,002
Anaconda, c. s	25											17½	17⅜	700
Arcadian, c	25									40				375
Arnold, c	25											8¼	8	
Atlantic, c	25									22¼	21	23½	22½	205
Bingham Con	50	21	20¼	21				21¼	20½					3,948
Bonanza Dev. g	10	50												100
British Col., c	5													
Calumet & Hecla	25	457½		460	450					459	458	458		75
Centennial, c	25	20½	18¼	20½	19½			20	19½	19½	19	21¾	19⅞	9,033
Central Oil	25													
Con. Mercur, g	5									57½	55	58	55	650
Copper Range	100	43⅜	42¾	43¼	42⅜			43⅜	42⅛	43	42⅛	44	43	8,888
Daly West, g. s. l	20	26	25	24	24½			25¾	25¼	26	25	26	25½	4,940
†Dominion Coal	100													
Preferred	100			109	107							138		231
Dominion I. & S	100									9		9½		185
Elm River, c	12	2¼		2⅜	2¼			2⅜		2¼		2⅜		850
Franklin, c	25	8	7⅛					7⅛				7¾		167
Granby Con	10			2¾				3		3		3		800
Guanajuato Con	5	1 1/16		1⅛				1				1½		4,150
Isle Royal Con	25							7⅛	7			7⅜		450
Mass Con., c	25	4½		4⅝						4¼	4	4½		200
Mayflower, c	25													
Michigan, c	25	5¾	5¼	5½				5⅛		5⅜	5⅛	5½		450
Mohawk, c	25	40	39½	40⅛	40			40	38⅛	40½	39¼	41	40¼	2,022
Mont. Coal & C	25													
Mont'l & Boston	5													
New Idria, q	5	9												100
Nova Scotia St	100													
Preferred	100													
Old Colony, c	25													
Old Dominion, c	25	14½	13	14	13¼			14¾	13¾	14½		14	13⅝	5,345
Osceola, c	25	59	58					59		58		60	59	345
Parrot, s. c	10	25¾	25⅜	25¾	25			25	25	25⅛		28	25½	770
Phœnix Con, c	25			1¾				1½				2	1⅝	585
Quincy, c	25	84	82	86	84					85		89½	85	271
Rhode Island, c	25													
Santa Fe, g. c	10									1⅜		1⅝		200
Shannon, c	10	8¼	8					8⅛		8¼	8⅛	8⅜	8⅛	2,140
Tamarack, c	25	95		97½				97				99	95	106
Tecumseh, c	25													
Tennessee, c	25													
Trinity, c	25	4¼	4⅛	4¼	4			4⅛		4⅛	4	4⅛		550
United c	100													
United States, g	10	21⅜	21	21¼	21			21⅛	20¾	20⅞		21⅛	20⅜	3,530
U. S. Coal & Oil	25	9⅜		9⅜						9⅜	9⅛	9⅝	9⅜	335
Utah Con., g. c	5	34⅛	34	34¼	33⅞			34		34	33¾	34¼	34	2,481
Victoria, c	25	3¼		3¼	3⅛			3¼		3⅛	3	3¼	3	1,120
Winona, c	25	7⅛	6¾	7				7	6¾	7		7		1,120
Wolverine, c	25	71½	71¼	71½	71					113⅛		71⅜	71	1,487
Wyandot, c	25											75		40

*Holiday. †Ex-dividend. ‡Assessment Paid. Total sales, 79,978 shares.
c—Copper g—Gold. l—Lead. q—Quicksilver. s—Silver.

Duluth, Minn.

Company	Par Val.	Bid.	Asked.	Company	Par Val.	Bid.	Asked.
Calumet & Arizona	$10	$110	$111	Lake Sup. & Pitts Dev.	$10	$130	$135
Calumet & Bisbee	10	7.50	8.00	Pitts. & Duluth Dev.	15	50.00	51.00
Calumet & Cochise	10	7.50	8.00	Shakespeare			.20
Calumet & Pittsburg	10	33.50	35.00	United Mexican			.50
Higgins Development	10	3.00		Wolverine & Arizona	10	4.00	
Junction Development	15	14.00	14.50	Yaqui	10		1.50

COAL, IRON AND INDUSTRIAL STOCKS.

Company.	Par val.	Mar. 30 H.	Mar. 30 L.	Mar. 31 H.	Mar. 31 L.	Apr. 1† H.	Apr. 1† L.	Apr. 2 H.	Apr. 2 L.	Apr. 4 H.	Apr. 4 L.	Apr. 5 H.	Apr. 5 L.	Sales
Allis-Chalmers	$100													
Preferred	100										40½		43		200
Am. Agr. Chem	100													
Preferred	100													
Am. Sm. & Ref	100			49½	49			48⅝	48⅞	49¼		48¾	48¼	2,100
Preferred	100	93		93	92¾			92½	92¼	93⅛	93	93⅛	93⅛	1,363
Col. Fuel & I	100			28¾	28					29	28¾	30⅛	28¼	3,355
Preferred	10											63		100
Col. & H. C. & I	100	13⅜	13											200
*Crucible Steel	100	5		5						5		4⅞		605
*Preferred	100	31		31½				32¼	31¼			31¾	31	301
General Chem	100													
Preferred	100													
Mong. R. Coal	50			8										850
*Preferred	100	26¼	26	28¼	28							26¾	26	470
National Lead	100			15										100
Preferred	100													
*Phila. Nat. Gas	100	40		39				39½	39	39¼	38⅞	39		645
†Preferred	100													
*Pittsburg Coal	100			16¾	16½					16½				1,430
*Preferred	100	61½	60½	60½	60					60½	60	60½	60	1,809
Republic I. & S	100			7⅜				7⅜		7⅜	7⅛	7⅜	7⅛	2,200
Preferred	100	43⅞		42¼				43¼		44⅛	43⅛	47	44	2,565
Sloss-Shef S. & I	100	39½		39¾						39½				400
Preferred	100													
‡Standard Oil	100									620				42
Tenn. C.I. & R.R	100	38¾	38	39¾	38¼			39½	39	39	38¼	40	39	13,635
U.S. Red. & Ref	100													
Preferred	100													
U.S.Steel Corp	100	11⅜	11	11⅛	11⅛			11⅛		11	10⅜	11⅛	10⅞	27,201
Preferred	100	58¾	57⅝	59½	58⅜			59¼	59⅛	59	58⅛	59¾	58⅜	254,825
Va.-Car Chem	100			29								30¾	¾	620
Preferred	100													

*Pittsburg exchanges. †Holiday. ‡Ex. dividend. Total sales, 313,816.

COLORADO SPRINGS, COLO

Company.	Par Val	Mar. 26 H.	Mar. 26 L.	Mar. 28 H.	Mar. 28 L.	Mar. 29 H.	Mar. 29 L.	Mar. 30 H.	Mar. 30 L.	Mar. 31 H.	Mar. 31 L.	Apr. 1 H.	Apr. 1 L.	Sales
Acacia	$1	.07	.05½	.08½	.06¼	.06½	.03	.07	.06	.05⅝	.05½	.06⅝	.06	2,000
American Con	1													
Anaconda	5	.14	.11	.13		.14	.11	.14	.12	.14	.11⅜	.13	.11½	1,000
Colo. City & M	1	.02⅛	.01½	.02⅞	.02⅛	.02⅜	.02⅛	.02½		.03	.02½	.02⅝	.02½	1,000
C. K. & N	1	.22	.20½	.22	.20	.21	.20½	.21	.20¾	.23	.21¼	.22⅜	.22½	10,000
Cripple Ck. Con	1	.06⅜	.06¼	.06¼	.05⅝	.06½	.06⅜	.06½	.06¼	.06⅜	.06⅛	.06¼	.06⅛	4,500
Des Moines	1	.02⅜	.02	.02½	.02	.02¼	.02	.02		.02½	.02	.02		
Doctor Jack Pot	1	.06½	.05¾	.06½	.05⅜	.08	.05	.07	.06	.07½	.06¼	.07¼	.06½	
Elkton Con	1	.66	.63⅝	.65	.63	.64	.62	.63	.60	.64	.63	.64	.60½	9,460
El Paso	1	.77	.76½	.77¼	.76¾	.77	.76½	.77½	.76	.77	.76⅜	.78	.77	4,600
Gold Dollar Con	1	.05¼	.05	.05⅛	.05	.05¼	.05¼	.05¼	.05	.05¼	.05	.05¼	.05⅛	8,000
Gold Sovereign	1	.04	.03¾	.04	.03⅞	.04	.03⅞	.04⅛	.03⅞	.04⅛	.03⅞	.04⅛	.03¾	9,000
Golden Cycle	1	.50	.40	.48	.42	.50	.40	.04½	.03⅞	.45	.40	.40	.40	2,000
Golden Fleece	1	.02		.02		.02		.02		.02				
Hart	1	.02¼		.02¼		.02⅛		.02¼		.02¼		.02⅛		
Isabella new	1	.29½	.28	.29½	.29	.29½	.28	.29½	.28	.29½	.28	.29	.28	2,250
Jack Pot	1	.05		.03½	.05¾	.09		.09		.09		.05		
Keystone	1	.03⅝	.03½	.03⅞		.01	.03¼	.03¼	.03½	.03⅝	.03⅛	.04	.03½	1,000
Last Dollar	1	.45		.45		.45		.45		.45		.45		
Lexington	1	.04½	.03⅞	.04⅜	.03⅞	.04¼	.03⅞	.04	.03¾	.04	.03⅝	.03⅞	.03⅛	
Little Puck	1	.03½	.03⅜	.03½	.03	.03¼	.03	.03¼	.03	.03⅜	.03	.03⅝	.03	4,000
Mollie Gibson	1	.07	.05	.03½	.05	.06⅛	.05	.06	.05¼	.06¼	.05½	.06	.05	
Moon-Anchor	5	.09½	.07	.09	.08	.08⅜	.07	.08¼	.07½	.08½	.07½	.10	.07	3,500
New Haven	5	.03	.02⅞			.03	.02⅞	.03	.02¾	.03	.02⅝	.02⅞	.02¼	
Old Gold	1	.12	.10	.12	.10	.11	.10⅞	.11½	.10½	.11½	.10⅜	.11⅛	.10⅜	3,000
Pharmacist	1	.04	.03½	.04	.03⅝	.03⅞	.03⅝	.03¾	.03½	.03¾	.03½	.03⅜	.03¼	1,000
Pinnacle	1	.04		.03¾		.04		.04		.03½		.03⅛		
Portland	1	1.70	1.50	1.70		1.70	1.50	1.80	1.50	1.80	1.57	1.55		100
Vindicator Con	1	.60½	.60½	.64	.60½	.66	.60⅛	.66	.60¼	.66	.60¼	.66	.60½	
Work	1	.06⅜	.06	.06¼	.06	.06¾	.06	.06½	.05⅞	.06¼	.06	.06¼	.06	

Total sales, 66,350 shares.

COLORADO SPRINGS (By Telegraph).

Company.	Apr. 4 H.	Apr. 4 L.	Apr. 5 H.	Apr. 5 L.	Company.	Apr. 4 H.	Apr. 4 L.	Apr. 5 H.	Apr. 5 L.
Anaconda	.14	.11	.13	.11	Jack Pot	.09	.05	.09	.05
Cripple Ck Con	.07	.06¾	.07⅛	.06⅞	Last Dollar	.45	.40	45	.40
C. K. & N	.23	.21⅞	.23	.21½	Mollie Gibson	.06¾	.05	.06¼	.05
Doctor-Jack Pot	.07¼	.06¼	.07⅛	.06½	Moon Anchor	.09	.07	.08	.07
Elkton Con	.64	.62¾	.64	.62	Old Gold	.10⅞	.10¼	.10	.09⅝
El Paso	.77¾	.77¼	.78½	.78	Pharmacist	.04	.03½	.037⅛	.03⅜
Gold Dollar Con	.05⅛	.05	.05½	.05	Portland	1.80	1.60	1.75	1.50
Gold Sovereign	.04⅜	.04	.04½	.04	Vindicator	.67	.60	.70	.05½
Isabella	.28¾	.28	.29	.27	Work	.06⅜	.06	.06½	.06

SAN FRANCISCO.

Company.	Location.	Mar. 24 H.	Mar. 24 L.	Mar. 25 H.	Mar. 25 L.	Mar. 26 H.	Mar. 26 L.	Mar. 28 H.	Mar. 28 L.	Mar. 29 H.	Mar. 29 L.	Mar. 30 H.	Mar. 30 L.	Sales
Central Eureka	Cal									.08				500
Golconda	Ore													
Golden Anchor	Nev													
Hannapah	Nev													
Lightner Mg. Co.	Nev													
MacNamara	Nev			.25		.21		.22		.22		.22		250
Mont. Tonopah	Nev			1.30	1.25	1.30	1.27½			1.35	1.30	1.40	1.37½	2,040
Penna. C. M. Co	Cal													
South Eureka	Cal													
Ton. Belmont	Nev					.61	.57	.56	.55	.36	.35	.61	.58	1,650
Ton. Midway	Cal	.36	.35	.35		.38						.38		450
Ton. Mg. Co	Nev													
Ton. North Star	Nev	.29		.30								.31		650
Ton. & Salt Lake	Nev													
Ton. Superior	Nev													
Wild Goose	Ala													

San Francisco and Tonopah Mining Exchange.
Total sales, 22,140 shares.

SAN FRANCISCO (By Telegraph).

Company.	April 4.	April 5.	Name of Company.	April 4.	April 5.
Belcher	25	22	Gould & Curry	.42	.42
Best & Belcher	2.00	2.00	Hale & Norcross	.88	.86
Caledonia	1.20	1.20	Mexican	2.45	2.50
Challenge Con	.30	.30	Ophir	5.75	5.87½
Chollar	.20	.19	Overman	.22	.21
Confidence	.56	.50	Sierra Nevada	.73	.73
Con. California & Virginia	1.85	1.80	Union Con	.88	.82
Crown Point	.18	.18	Yellow Jacket	.32	.32

STOCK QUOTATIONS

MEXICO.* Mar. 24

Company.	Shares Issued.	Prices. Bid.	Prices. Ask.
Durango:			
Ca. Min. de Penoles	2,500	$3,600	$3,800
San Andres de la Sierra	200	10,000	.....
Guanajuato:			
Angustias, Pozos	2,400	45	50
Cinco Senores y An., aviadoras	2,000	40	50
Cinco Senores y An., aviada	400	40	50
Providencia, San Juan de la Luz	6,000	75	80
Queensland y Australia	300	55	75
Guerrero:			
Delfina, 1st serie	2,500	52	57
Delfina, 2nd serie	2,500	35	40
Garduno y Anexas	7,200	30	40
Hidalgo:			
Amistad y Condordia	9,600	83	84
Carmen, aviada	1,100	50	90
Guadalupe Fresnillo Mill	1,000	170	200
Guadalupe Fresnillo Mine	1,400	70	80
La Blanca, aviadora	1,536	.....	.....
La Blanca, aviada	768	.....	.....
La Reina y An., aviadora	5,600	5	8
Luz de Maravillas, aviadas	1,100	.....	20
Maravillas y An., aviador	1,680	120	140
Maravillas el Lobo	1,000	130	180
Palma y An., aviador	1,800	8	16
Real del Monte	2,554	.....	.....
Refugio, aviada	12,800	680	740
Santa Anay An., aviadora	1,800	90	95
Santa Anay An., aviada	600	30	40
Sta. Gertrudis y An., aviadas	9,600	13	15
Sta. Gertrudis y An., aviadora	28,800	83½	84
Santo Tomas Apostol aviadoras	5,100	2	3
San Felipe de Jesus, aviadora	3,600	16	18
San Felipe de Jesus, aviada	1,200	6	10
San Rafael y An., Trompillo	1,200	1,700	1,720
San Rafael y An., aviada	1,200	685	679
Soledad, aviada	670	685	680
Sorpresa, aviada	960	280	285
.....	.....	.....	.....

Name of Company.	Shares Issued.	Prices. Bid.	Prices. Ask.
Mexico:			
Alacran	2,400	20	28
Aldebarren	2,000	30	38
Buen Despacho	3,000	36	40
Dos Estrellas	3,000	1,650	1,700
La Esperanza (El Oro.)	3,000	1,500	1,500
La Reformia, aviadores	2,000	20	25
Providencia, pagadoras	1,600	.....	.....
Providencia, liberadas	900	.....	.....
Santa Ana, Esperanza	2,400	90	.....
Michoacan:			
Luz de Borda, aviadora	3,000	55	62
Luz de Borda, aviado	1,000	25	33
Santiago y An., Tlal.	4,000	4	6
Nuevo Leon;			
La Fraternal	1,000	580	620
Norias de Bajan	1,000	880	920
San Luis Potosi:			
Concepcion y An.	3,000	64	70
El Barreno, aviadora	2,000	48	52
Sta. Maria de la Paz	9,600	145	150
San Diegoy Annexas	2,400	8	10
Zacatecas:			
Asturiana y An.	2,500	20	30
Candelaria y Pinos	2,500	130	140
Cubiertas	2,400	.....	.....
Esperanza y An.	2,400	6	8
Lourdes	2,500	22	27
Luz de Minillas, pagadoras	2,000	15	30
Nueva Quebradilla, aviadoras	2,400	20	40
Nueva Quebradilla, aviadas	600	23	40
San Carlos y Annexas	2,500	57	60
Sta. Maria de Gaud	2,500	60	70
Miscellaneous:			
Bartolome de Medina	2,000	78	84
Guadalupe Hacienda	20,000	.....	.....
La Luz Hac. (Pachuca.)	3,750	.....	.....
La Reina (Chihuahua.)	192	.....	.....
Naica (Chihuahua.)	100	11,000	13,000
Natividad (Oaxaca) aviadora	1,800	950	100
Natividad (Oaxaca) aviadas	600	.....	.....
San Francisco Hac	6,000	65	70
Santa Ana Huantla Morelos	4,000	.....	.....
Union Hacienda	3,000	215	230

*Values are in Mexican currency.

TORONTO, ONT. April 2

Company.	Par val	Prices. High.	Prices. Low.	Sales
Black Tail, g.	$1	.03	.02	.....
Cariboo-McKin	1	.02½	.01½	.....
Cariboo-Hydr.	1	.75	.....	.....
Center Star, g. s.	1	.28	.25	.....
Crows Nest, C.C.	100	3.25	2.25	.....
Dominion Coal	100	.....	.....	.....
Dominion S. & I.	100	.....	.....	.....
Fairview, g. s.	1	.04	.02½	.....
Giant, g. s.	1	.....	.....	.....
Deer Trail, g. s.	1	.02	.01	.....
Iron Mask, g. s.	1	.06	.....	.....
Morrison, g. s.	1	.03	.01	.....
.....	.....	.....	.....	.....

Company.	Par val	Prices. High.	Prices. Low.	Sales
Granby Smelter	$10	4 20	3.60	.....
Mountain Lion, g.	1	.15	.09	.....
North Star, g. s.	1	.10	.07	.....
Nova Scotia Steel.	100	.....	.....	.....
Payne, s. l.	1	.11	.07	.....
Rambler Carib	1	.29	.24	.....
Republic, g.	1	.02	.....	.....
St. Eugene, g. s.	1	.47	.39	.....
Virtue, g. s.	1	.....	.....	.....
War Eagle Con.	1	.15	.10	.....
Sullivan, g. s.	1	.06	.04	.....
Winnipeg, g. s.	1	.03	.02	.....
Wonderful, g. s.	1	.03	.....	.....

g—Gold. l—Lead. s—Silver. Total sales, none.

SALT LAKE CITY.* April 4

Company	Par Val	High	Low	Sales.
Ajax	10	.09	.09	800
Bullion-Beck	...	1.35	1.35	200
Butler Liberal	....	.10⅜	.10½	1,600
Carisa	..	.06⅜	.06	2,000
Century	1	.73	.72	300
Con. Mercur	1	.55	.54	800
Daly	20	2.70	2.55	400
Daly-Judge	....	4.25	4.25	200
Daly West	½	28.50	25.75	795
Grand Central	....	4.05	4.00	100
Ingot	1	.00¾	.00⅝	2,000
Joe Bowers	..	.00⅞	.00⅞	5,000
.....	...	.....	.....	.....
.....	...	.....	.....	.....

Name of Company	Par Val	High	Low	Sales.
L. Mammoth	⅛	.32	.32	900
Mammoth	....	101	101	400
May Day	....	.06⅛	.05⅞	500
Martha Wash	....	.01⅜	.01¼	4,000
N. Y. Bonanza	5	.09¼	.09	6,600
Silver Shield	1	.03¼	.03¼	500
Star Con	....	.16	.16	200
Tetro	....	.33½	.27½	34,600
Uncle Sam Con	1	.18¼	.18	4,200
Victor, Con	....	.04	.04	200
Yankee Con	....	.43	.41½	700
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

*By our Special Correspondent. All mines are in Utah. Total sales, 86,985 shares.

PHILADELPHIA, PA

Company.	Par val.	Mar. 30 H.	Mar. 30 L.	Mar. 31 H.	Mar. 31 L.	Apr. 1* H.	Apr. 1* L.	Apr. 2 H.	Apr. 2 L.	Apr. 4 H.	Apr. 4 L.	Apr. 5 H.	Apr. 5 L.	Sales
Am. Cement	$10	.....	.....	.....	.....	.....	.....	7⅛	.....	7⅜	.....	7⅜	.....	315
Cambria Iron	50	.....	.....	45¾	45	.....	.....	45¾	.....	.....	.....	.....	.....	65
Cambria Steel	50	20½	20	20¼	20	.....	.....	20½	20	20¼	.....	20¼	.....	1,529
Pa. Steel, pfd	100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Susq. I. & S.	5	¾	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	160
United Gas I.	50	84¼	84	84	83	.....	.....	83	.....	83	.....	83¼	83	557
Lehigh Nav'n	50	.....	.....	68	67½	.....	.....	68	.....	.....	.....	68	.....	96
Philadelphia	50	40⅛	39⅛	40¼	39¼	.....	.....	39⅜	39	39⅜	39	.....	.....	3,841
U.S. Steel	100	11¼	11⅛	11⅜	11⅛	.....	.....	11	.....	11	10⅞	11⅛	10⅞	2,449
U.S. Steel. pf.	100	58¾	57⅝	58⅛	58¼	.....	.....	58⅞	.....	58¼	.....	58¼	58¼	13,010

*Holiday. Total sales 21,962.

LONDON. Mar. 25

Company.	Shares Issued.	Par value.	Latest dividend. Amt.	Latest dividend. Date.	Quotations. Buyers.	Quotations. Sellers.
American:		£. s. d.	s. d.		£ s. d.	£ s. d.
*Alaska-Treadwell	200,000	5 0 0	3 0	Feb., 1904	4 12 6	4 17 6
Anaconda	1,200,000	5 0 0	2 0	Nov., 1903	3 7 6	3 10 0
Camp Bird	820,000	1 0 0	9	Feb., 1904	1 3 9	1 6 3
Copiapo	112,500	2 0 0	6 10	May, 1903	1 0 0	1 1 5
De Lamar	80,000	1 0 0	2 9	Oct., 1903	10 0	12 6
El Oro	1,080,000	1 0 0	9	Jan., 1904	1 1 3	1 3 9
Frontino & Bolivia	128,662	1 0 0	3 0	July, 1901	8 9	11 3
Le Roi	200,000	5 0 0	5 0	Nov., 1899	1 12 6	1 15 0
Le Roi No. 2	120,000	5 0 0	1 0	Feb. 1904	17 6	1 0 0
Montana	657,128	1 0 0	6	April, 1899	9	1 0
Palmarego & Mexican	445,000	1 0 0	rts.	April, 1903	7 3	7 9
Standard	500,000	4 0	2½	Sept., 1903	2 6	3 6
Stratton Independence	1,000,007	1 0 0	6	Dec., 1903	3 6	4 0
St. John del Rey	546,265	1 0 0	6	Dec., 1903	13 6	14 6
Tomboy	300,000	1 0 0	1 0	June, 1902	1 5 0	1 10 0
Ymir	200,000	1 0 0	1 0	Mar., 1902	1 3	3 9
European:						
Linares	15,000	3 0 0	5 0	Mar., 1904	4 0 0	4 10 0
Mason & Barry	185,172	1 0 0	11 0	May, 1903	3 12 6	3 17 6
Rio Tinto	325,000	5 0 0	37 6	Apr., 1904	50 5 0	50 10 0
Rio Tinto, preferred	325,000	5 0 0	2 6	Apr., 1904	6 0 0	6 5 0
Tharsis	625,000	2 0 0	7 0	May, 1904	4 12 6	4 17 6
West Australian:						
Associated	495,388	1 0 0	2 0	Jan., 1904	2 8 9	2 11 3
Cosmopolitan	400,000	1 0 0	1 0	May, 1903	13 9	14 3
Golden Horseshoe	300,000	5 0 0	6 0	Apr., 1904	8 3 9	8 6 3
Great Boulder	1,750,000	2 0	9	Mar., 1904	1 6 0	1 6 3
Gt. Boulder Persever'ce	1,400,007	1 0 0	1 3	Feb., 1904	1 0 6	1 1 6
Great Fingall	250,000	1 0 0	7 0	Apr., 1904	8 5 0	8 7 6
Ivanhoe	200,000	5 0 0	5 0	Jan., 1904	8 5 0	8 7 6
Kalgurli	120,000	1 0 0	2 6	Apr., 1904	5 6 3	5 8 9
Lake View	250,000	1 0 0	rts.	Aug., 1902	1 1 3	1 3 9
Oroya-Brownhill	450,000	1 0 0	2 6	Mar., 1904	3 8 9	3 10 0
Miscellaneous:						
Brilliant Central	100,000	1 0 0	1 0	Apr., 1904	2 17 6	3 2 6
Briseis	600,000	1 0 0	.. ..	.....	7 6	8 9
Broken Hill	900,000	8 0	1 6	Feb., 1904	1 13 6	1 14 6
Mt. Lyell	275,000	3 0 0	4 3	Sept., 1903	15 6	16 6
Mt. Morgan	1,000,000	1 0 0	3	Mar., 1904	2 0 0	2 2 6
Waihi	497,412	1 0 0	2 6	Mar., 1904	4 18 9	5 1 3
Indian:						
Champion Reef	513,832	10 0	6 6	Jan., 1904	1 15 0	1 16 3
Mysore	566,043	10 0	5 6	Mar., 1904	6 8 9	6 11 3
Nundydroog	484,000	10 0	1 8	Mar., 1904	2 0 0	2 2 6
Ooregum	343,000	10 0	1 3	Apr., 1904	1 1 3	1 3 9
Ooregum, pfd	240,000	10 0	1 3	Apr., 1904	1 8 9	1 11 3
South African:						
Angelo	600,000	1 0 0	4 0	Feb., 1904	6 0 0	6 5 0
Bonanza	200,000	1 0 0	10 0	Feb., 1904	1 17 6	2 0 0
British South Africa	4,438,019	1 0 0	rts.	May, 1899	1 11 1	1 12 3
Cape Copper	300,000	2 0 0	4 0	Jan., 1904	2 12 6	2 17 6
Cape Copper, pfd	75,000	2 0 0	1 9	Jan., 1904	2 15 0	3 0 0
City & Suburban	340,000	4 0 0	8 0	Feb., 1904	6 7 6	8 10 0
Consol. Gold-Fields	2,000,000	1 0 0	.. ..	.....	5 15 0	5 16 3
Crown Reef	120,000	1 0 0	18 0	Apr., 1904	16 5 0	16 15 0
De Beers, preferred	800,000	2 10 0	10 0	Jan., 1904	18 13 9	18 16 3
De Beers, deferred	1,000,000	2 10 0	15 0	Jan., 1904	19 6 3	19 8 9
East Rand	990,000	1 0 0	5 0	Aug., 1903	6 2 6	6 3 9
Ferreira	90,000	1 0 0	3 0	May, 1904	18 15 0	19 5 0
Geldenhuis	200,000	1 0 0	6 0	Feb., 1904	5 0 0	5 2 6
Geduld	400,000	1 0 0	rts.	Mar., 1902	5 7 6	5 10 0
Henry Nourse	125,000	1 0 0	10 0	Feb., 1904	8 10 0	8 12 6
Jubilee	50,000	1 0 0	5 0	Feb., 1904	4 0 0	4 5 0
Jumpers	100,000	1 0 0	2 6	May, 1904	2 10 0	2 12 6
Langlaagte	470,000	1 0 0	2 0	Feb., 1904	3 6 3	3 8 9
May	288,750	1 0 0	3 6	Feb., 1904	3 15 0	3 17 6
Meyer & Chariton	100,000	1 0 0	5 0	Jan., 1904	5 0 0	5 5 0
Modderfontein	290,000	1 0 0	rts.	Apr., 1902	7 2 6	7 5 0
Namaqua	94,331	2 0 0	3 0	Dec., 1903	2 17 6	3 2 6
New Jagersfontein	200,000	5 0 0	10 0	Dec., 1903	27 15 0	28 5 0
New Primrose	325,000	1 0 0	3 0	Mar., 1904	3 12 6	3 15 0
Rand	1,795,956	5 0 0	4 0	Aug., 1902	9 0 0	9 1 3
Robinson	750,000	5 0 0	5 6	Feb., 1904	9 2 6	9 7 6
Robinson Deep	950,006	1 0 0	3 0	Jan., 1904	4 18 9	5 1 3
Rose Deep	425,000	1 0 0	2 6	Feb., 1904	7 2 6	7 7 6
Salisbury	100,000	1 0 0	2 0	Mar., 1899	1 10 0	1 15 0
Village	400,000	1 0 0	3 0	Feb., 1904	6 2 6	6 7 6
Wemmer	80,000	1 0 0	10 0	Jan., 1904	9 15 0	10 5 0

*Ex-dividend.

LONDON (By Cable.)*

Company.	Mar. 30 £.	Mar. 30 s.	Mar. 30 d.	Apr. 5 £.	Apr. 5 s.	Apr. 5 d.
Anaconda	3	10	0	3	7	6
British So. Africa	1	12	6	1	15	0
Camp Bird	1	4	6	1	4	9
Con. Gold Fields	5	8	9	5	17	6
De Beers	19	5	0	19	17	6
East Rand	6	5	0	6	11	3

Company.	Mar. 30 £.	Mar. 30 s.	Mar. 30 d.	Apr. 5 £.	Apr. 5 s.	Apr. 5 d.
El Oro	1	1	10½	1	1	3
Modderfontein	6	8	9½	6	16	3
Rand Mines	9	5	0	9	11	3
Rio Tinto	51	7	6	52	12	6
Simmer & Jack	1	8	1	1	10	0
Tomboy	1	6	3	1	7	6

*Furnished by Wm. P. Bonbright & Co., 15 Wall St., New York.

PARIS. Mar. 17

Company.	Location.	Capital Stock.	Par value.	Latest divs.	Prices. Opening.	Prices. Closing.
		Francs.	Fr.	Fr.	Fr.	Fr.
Anzin, Coal	France	.....	.....	290.00	5,300.00	5,280.00
Boleo, c	Lower Cal.	12,000,000	500	62.50	1,652.00	1,670.00
Champ d'Or, g	S. Africa	3,375,000	25	3.75	15.25	18.00
Courrieres, Coal	France	900,000	500	110.00	2,675.00	2,690.00
Fraser River, g	Brit. Col.	250,000	25	.....	5.50	5.50
Huanchaca, s	Bolivia	40,000,000	125	2.50	62.75	68.75
Laurium, z. l	Greece	16,300,000	500	25.00	320.00	320.00
Malfidano, z	Italy	12,500,000	500	50.00	598.00	590.00
Metaux, Cie. Fran. de	France	25,000,000	500	22.50	452.00	462.00
Mokta-el-Hadid, i. l	Algeria	18,312,000	500	40.00	806.00	849.00
Nickel, n	N. Caledonia	15,000,000	250	22.50	515.00	518.00
Penarroya, Coal	Spain	.....	500	45.00	1,050.00	1,095.00
Vielle Montagne z	Belgium	9,000,000	30	30.00	682.00	690.00
Wyoming, o	Wyoming	.....	25	.....	357.00	200.00

c—Copper. g—Gold. i—Iron. l—Lead. n—Nickel. o—Oil. s—Silver. z—Zinc.

ST. LOUIS, MO.* April 2

Name.	Par Val.	Prices. Bid.	Prices. Ask.
Am.-Nettie, Colo	$10	$0.15	$0.25
Catherine Lead, Mo.	10	1.50	2.50
Central Coal & C	100	61.00	62.50
Central C. & C., pf.	100	69.00	70.50
Central Lead, Mo	100	115.00	120.00

Name.	Par Val.	Prices. Bid.	Prices. Ask.
Columbia Lead, Mo.	$10	$3.50	$4.50
Con. Coal, Ill.	100	17.00	18.00
Doe Run Lead Mo.	100	110.00	115.00
Granite Bimet. Mt.	10	.35	.38
St. Joe Lead, Mo.	10	14.50	16.50

*By our Special Correspondent.

DIVIDENDS.

GOLD, SILVER, COPPER, LEAD, QUICKSILVER AND ZINC COMPANIES.—UNITED STATES.

Name and Location of Company.		Authorized Capital Stock.	Shares. Issued.	Par Val	Dividends. Paid 1904	Total to Date	Latest. Date.	Amt.
Acacia, g.	Colo.	$1,500,000	1,433,000	$1	.....	$57,500	Apr. 1903	$0.01
Adams, s. l. c.	Colo.	1,500,000	150,000	10	.....	738,500	Oct. 1902	.05
Aetna Con., q.	Cal.	500,000	10,050	5	.....	325,000	Apr. 1900	.15
Alaska-Mexican, g.	Alaska.	1,000,000	180,000	5	$54,000	627,381	Mar. 1904	.20
Alaska-Treadwell, g.	Alaska.	5,000,000	200,000	25	375,000	5,645,000	Apr. 1904	1.12½
Amalgamated, c.	Mont.	155,000,000	1,533,879	100	769,430	23,503,837	Feb. 1904	.50
Am. Sm. & R-f. com	U. S.	50,000,000	500,000	100	1,250,000	1,250,000	Apr. 1904	1.25
Am. Sm. & Ref., pf.	U. S.	50,060,000	500,000	100	1,756,000	14,141,553	Apr. 1904	1.75
Anaconda, c.	Mont.	30,000,000	1,200,360	25	.....	23,250,000	Nov. 1903	.50
Annie Laurie, g.	Utah	5,000,000	25,000	100	37,500	312,500	Mar. 1904	.50
Arizona, c.	Ariz.	3,775,000	.....	...	554,001	5,222,259	Feb. 1904	.....
Bald Butte, g. s.	Mont.	250,000	200,000	1	25,000	1,337,148	Jan. 1904	.12½
Big Six., s. l.	Colo.	500,000	500,000	1	.....	17,500	Nov. 1903	.00½
Boston & Colo. Sm.	Colo.	750,000	15,000	50	.....	402,350	Oct. 1902	.75
Boston & Mont.	Mont.	3,750,000	150,000	25	300,000	28,625,000	Jan. 1904	2.00
Breece, l. s.	Colo.	5,000,000	200,000	25	.....	200,000	June 1904	.05
Bunker Hill & Sull.	Idaho	3,000,000	300,000	10	108,000	1,628,000	Mar. 1904	.15
Butler-Liberal, g. s.	Utah	500,000	500,000	1	.....	2,500	Dec. 1903	.00½
Butte & Boston, c.	Mont.	2,500,000	200,000	25	200,000	1,800,000	Feb. 1904	1.00
C. K. & N., g.	Colo.	1,500,000	1,431,900	1	14,319	100,231	Feb. 1904	.01
Calumet & Arizona, c	Ariz.	2,500,000	200,000	10	300,000	700,000	Mar. 1904	1.50
Calumet & Hecla, c.	Mich.	2,500,000	100,000	25	1,000,000	84,350,000	Mar. 1904	10.00
Camp Bird, g.	Colo.	5,500,000	820,000	5	147,600	1,115,304	Feb. 1904	.18
Cashier, g.	Colo.	1,000,000	930,000	1	5,940	23,760	Jan. 1904	.00½
Centennial Eureka.	Utah	5,000,000	100,000	25	.....	2,067,700	Jan. 1902	.50
Center Creek, l. z.	Mo.	1,000,000	100,000	10	.....	110,000	July 1903	.10
Central Eureka, g.	Cal.	4,000,000	398,425	10	23,915	259,900	Mar. 1904	.02
Central, l.	Mo.	1,000,000	10,000	100	15,000	400,000	Mar. 1904	.50
Century, g. s. l.	Utah	150,000	150,000	1	9,000	18,000	Mar. 1904	.02
Champion, c.	Mich.	2,500,000	100,000	25	.....	100,000	May 1903	1.00
Clinton, g. s.	Colo.	100,000	1,000	100	.....	60,000	Dec. 1903	.30
Con. Mercur, g.	Utah	5,000,000	1,000,000	5	.....	1,030,000	May 1903	.03
Continental, z.	Mo.	550,000	22,000	25	8,800	61,800	Jan. 1904	.40
Daly West, g. s. l.	Utah	3,000,000	180,000	20	351,000	3,842,000	Mar. 1904	.65
De Lamar, g. s.	Idaho	400,000	67,180	5	.....	2,740,340	Oct. 1903	.48
Deadwood-Stand. pf.	So. Dak	600,000	600,000	1	.....	6,000	Dec. 1903	.01
Doe Run, l.	Mo.	1,500 000	15,000	100	22,500	649,572	Jan. 1904	1 50
Elkton Con., g.	Colo.	3,000 000	2,500,000	1	.....	1,404,461	Mar. 1902	.04
El Paso, g.	Colo.	2,500,000	2,450,000	1	38.75	133,045	Mar. 1904	.00½
Federal Sm., pf.	Idaho	20,000,000	105,000	100	183,750	367 500	Mar. 1904	1.75
Gemini, g. s. l.	Utah	500,000	5,000	100	50,00	1,100,000	Mar. 1904	10.00
Gold Coin, g.	Colo.	1,000,000	1,000,000	1	.....	1,230,000	Jan. 1903	.01
Gold King,	Colo.	1,000,000	936,850	1	14,053	473,109	Jan. 1904	.01½
Golden Cycle, g.	Colo.	2,000,000	1,500,000	1	.....	348,750	Aug. 1903	.03
Good Hope, g, s.	Colo.	50,000	500	100	.....	941,250	Jan. 1903	.25
Grand Central, g.	Utah	250,000	250,000	1	50,000	941,250	Mar. 1904	.10
Gwin, g.	Cal.	1,000,000	100,000	10	.....	426,500	Dec. 1902	.15
Hecla, s. l.	Idaho	250,000	1,000,000	¼	20,000	140,000	Mar. 1904	.02
Hecla Con., s. l.	Mont.	1,500,000	30,000	50	.....	2,930,550	Apr. 1902	.25
Homestake, g.	So. Dak	21,840,000	218,400	100	167,800	12,531,550	Mar. 1904	.25
Horn Silver, g. s.c.z.l	Utah	10,000,000	400,000	25	20,000	5,382,000	Mar. 1904	.05
Internat. Nickel, pf.	U. S.	12,000,000	87,415	100	.....	349,660	May 1903	10.00
Iowa, g. s. l.	Colo.	1,998,667	1,998,667	1	16,667	353,504	Jan. 1904	.01
Iron Silver.	Colo.	10,000,000	500,000	20	100,000	2,950,000	Apr. 1904	.10
Jamison, g.	Cal.	3,900,000	390,000	10	11,700	132,600	Jan. 1904	.03
Kendall, g.	Mont.	2,500,000	500,000	5	100,000	405,000	Mar. 1904	.05
Kennedy, g.	Cal.	10,000,000	100,000	100	.....	1,801,001	June 1900	.05
La Fortuna, g.	Ariz.	250,000	250,000	1	.....	1,002,500	Oct. 1902	.05
Last Dollar, g.	Colo.	1,500,000	1,500,000	1	.....	240,000	Mar. 1903	.02
Liberty Bell, g.	Colo.	700,000	130,349	1	19,552	110,785	Jan. 1904	.15
Lightner, g.	Cal.	125,000	102,255	1	15,339	201,954	Mar. 1904	.05
Mary McKinney, g.	Colo.	1,000,000	1,000,000	1	30,000	550,000	Apr. 1904	.03
May Day, g.	Utah	100,000	400,000	¼	.....	30,000	Mar. 1902	.01
Midget, g.	Colo.	1,000,000	1,000,000	1	.....	195,000	Apr. 1902	.15
Mine La Mott, l.	Mo.	3,300,000	300,000	10	60,000	300,000	Jan. 1904	.20
Mines Co. of Am.	U. S.	2,000,000	2,000,000	1	75,000	530,000	Mar. 1904	.01½
Modoc, g. s.	Colo.	500,000	500,000	1	.....	270,000	Dec. 1903	.01
Mont. Ore Purch.	Mont.	2,500,000	81,000	25	[324,000	3,618,000	Apr. 1904	4.00
Mont.-Tonopah, g.	Nev.	1,000,000	885,000	1	.....	42,750	Dec. 1903	.06
Mountain, c.	Cal.	6,250,000	250,000	25	.....	3,776,250	May 1903	1.57
Napa Con., q.	Cal.	700,000	100,000	7	.....	1,180,000	Oct. 1902	.10
Nat. Lead, com.	U. S.	15,000,000	159,054	100	.....	1,341,486	Mar. 1900	1.00
Nat. Lead, pf.	U. S.	15,000,000	149,046	100	280,820	14,232,983	Mar. 1904	1.75
Nevada Keystone, g	Nev.	1,000,000	638,877	1	19,166	61,790	Feb. 1904	.03
New Century, z.	Mo.	150,000	150,000	1	2,250	2,250	Mar. 1904	.00½
New Idria, q.	Cal.	500,000	100,000	5	90,000	610,000	Apr. 1904	.30
New Jersey, z.	U. S.	10,000,000	100,000	100	300,000	6,300,000	Feb. 1904	3.00
New Lead. Home.	Colo.	2,000,000	2,000,000	1	.....	265,500	Feb. 1902	.00⅜
North Star, g.	Cal.	2,500,000	250,000	10	.....	706,356	Dec. 1903	.50
Northern Light, g. s.	Utah.	2,000,000	400,000	5	20,000	20,000	Feb. 1904	.05
Old Gold, g.	Colo.	2,101,150	2,101,150	1	10,506	10,506	Mar. 1904	.00½
Ontario, s. l.	Utah	15,000,000	150,000	100	.....	14,917,600	Dec. 1902	.30
Ophir, g. s.	Nev.	302,400	100,800	3	75,600	1,671,400	Mar. 1904	.25
Osceola, c.	Mich.	2,500,000	96,150	25	96,150	4,343,450	Jan. 1904	1.00
Parrot, c.	Mont.	2,300,000	229,850	10	.....	5,772,935	Jan. 1902	.02
Pennsylvania, g.	Cal.	5,150,000	51,500	100	15,450	202,575	Mar. 1904	.10
Portland, g.	Colo.	3,000,000	3,000,000	1	180,000	4,837,080	Jan. 1904	.06
Quicksilver, pf.	Cal.	4,300,000	43,000	100	.....	1,931,411	May. 1903	.50
Quilp, g.	Wash.	1,500,000	1,500,000	1	15,000	15,000	Apr. 1904	.01
Quincy, c.	Mich.	2,500,000	100,000	25	250,000	14,370,000	Feb. 1904	2.50
Red Bird, g. s. c. l.	Mont.	1,500,000	300,000	5	.....	36,000	Dec. 1903	.01
Rob Roy, z.	Mo.	15,000	13,825	1	277	2,530	Jan. 1904	.02
Rocco Homestake, l.s	Nev.	300,000	300,000	1	4,000	94,000	Jan. 1904	.01⅔
Sacramento, g.	Utah	5,000,000	1,000,000	5	5,000	198,000	Mar. 1904	.00½
St. Joseph, l.	Mo.	6,000,000	375,000	10	56,250	3,830,750	Mar. 1904	.15
Silver Hill, g. s.	Nev.	180,000	180,000	1	18,000	45,800	Mar. 1904	.05
Silver King, g. s. l.	Utah	3,000,000	150,000	20	300,000	7,650,000	Mar. 1904	.66⅔
Smuggler, s. l. z.	Colo.	1,000,000	1,000,000	5	.....	2,175,000	Feb. 1902	.01
Spearfish, g. pf.	So. Dak	1,000,888	882,006	1	.....	97,020	Nov. 1903	.01
Specie Payment, g.	Colo.	1,000,000	1,000,000	1	.....	40,190	Oct. 1902	.01
Standard Con., g. s.	Cal.	2,000,000	178,394	10	17,839	4,186,009	Feb. 1904	.10
Standard, c.	Ariz.	500,000	500,000	1	.....	40,000	Sept. 1903	.05
Stratton's Independ.	Colo.	5,500,000	1,000,007	5	.....	4,130,860	Dec. 1903	.12½
Swansea, s. l.	Utah	500,000	100,000	5	.....	330,500	June 1902	.05
Tamarack, c.	Mich.	1,500,000	60,000	25	90,000	8,580,000	Jan. 1904	1.50
Tennessee c.	Tenn.	5,000,000	175,000	25	218,750	437,500	Jan. 1904	1.25
Tomboy, g. s.	Colo.	15,00,000	300,000	5	.....	1,244,000	July 1902	.24
Tonopah-Alpine, g.	Nev.	700,050	700,000	1	.....	70,000	Dec. 1903	.10
Town Topics, g. s.	Colo.	1 000,000	1,000,000	1	.....	50,000	Nov. 1903	.00¼
Trinity County, g.	Cal.	1,000,000	99,003	10	.....	34,561	July 1903	.05
United, (Creede) g.	Colo.	500,000	500,000	1	.....	45,000	May 1904	.02
Union, g.	Colo.	1,250,000	1,250,000	1	.....	445,244	Jan. 1903	.02
United, c. pf.	Mont.	5,000,000	50,000	100	.....	450,000	Nov. 1903	3.00
United, Cripple(Ck)g.	Colo.	5,000,000	3,994,739	1	.....	319,933	Jan. 1902	.01
United, z. l., com.	Mo.	5,000,000	78,900	7	.....	30,725	Oct. 1903	.05
United, z. l. pf.	Mo.	1,000,000	18,998	25	9,499	134,855	Apr. 1904	.50
United Verde, c.	Ariz.	3,000,000	300,000	10	675,000	15,735,322	Mar. 1904	.75
U. S. Red. & Ref., com	Colo.	6,000,000	59,188	100	.....	414,078	Oct. 1903	1.00
U. S. Red. & Ref., pf.	Colo.	4,000,000	39,458	100	.....	472,821	Oct. 1903	1.50
Utah, g.	Utah	1,000,000	100,000	10	1,000	222,000	Mar. 1904	.01
Utah Con., c.	Utah	1,500,000	300,000	5	450,000	2,136,000	Jan. 1904	1.50
Vindicator Con., g.	Colo.	1,500,000	1,100,000	1	.....	1,115,000	Oct. 1903	.03
Waldorf, g.	Colo.	3,000,000	3 000,000	1	.....	47,000	July 1903	.0¾
Wasp No. 2, g.	So. Dak	500,000	150,000	1	7,500	225,910	Mar. 1904	.05
Wolverine, c.	Mich.	1,500,000	60,000	25	210,000	1,530,000	Apr. 1904	3.50
Yankee Con., g. s. l.	Utah	500,000	500,000	1	.....	75,000	Apr. 1902	.05
Yellow Aster, g.	Cal.	1,000,000	100,000	10	30,000	583,789	Feb. 1904	.15
.....		.....	.....	...	.....	.....	.....	.....

COAL, IRON AND INDUSTRIALS.

Name and Location of Company.		Authorized Capital Stock.	Shares. Issued.	Par Val	Dividends. Paid 1904	Total to Date.	Latest. Date.	Amt.
Ala. Con., C. & I., pf	Ala.	$2,500,000	$24,638	$100	$43,117	$732,797	Mar. 1904	$1.75
Ala. & Ga. Iron, pf.	Ala.	650,000	6,500	100	.....	6,500	Jan. 1903	1.00
Allis-Chalmers, pf.	U. S.	25,000,000	200,000	100	350,000	3,213,750	Feb. 1904	1.75
Alma Oil.	Cal.	400,000	380,000	1	.....	45,600	Dec. 1903	.03
Amer. Agr. Chem., pf.	U. S.	20,000,000	181,350	100	544,050	5,214,810	Apr. 1904	3.00
American Cement.	Pa.	2,100,000	200,000	10	80,000	620,000	Jan. 1904	.40
American Coal.	Md.	1,500,000	50,000	25	62,500	1,495,000	Mar. 1904	1.25
Aztec Oil.	Cal.	250,000	235,000	1	.....	43,050	Sept. 1903	.03
Bon Air C. & I., pf.	Tenn.	2,500,000	18,803	100	56,410	193,346	Apr. 1904	1.50
Cambria Steel.	Pa.	50,000,000	900,000	50	675,000	7,125,000	Feb. 1904	.75
Central C. & C., com.	Mo.	5,125,000	51,250	100	76,875	628,125	Jan. 1904	1.50
Central C. & C., pf.	Mo.	1,875,000	18,750	100	23,437	820,309	Jan. 1904	1.25
Central Oil	W. Va.	1,500,000	60,000	25	15,000	167,500	Feb. 1904	.25
Colo. Fuel & I., com	Colo.	38,000,000	239,310	100	.....	1,642,500	Apr. 1902	1.75
Colo. Fuel & I., pf.	Colo.	2,000,000	20,000	100	.....	1,560,000	Feb. 1903	4.00
Colum. & Hock. C.&I	Ohio.	7,000,000	69,244	100	34,622	121,153	May 1904	.25
Consolidated Coal.	Ill.	5,000,000	50,000	100	50,000	350,000	Jan. 1904	1.00
Consolidation Coal.	Md.	10,250,000	102,500	100	410,000	6,946,650	Feb. 1904	4.00
Crucible Steel, pf.	U. S.	25,000,000	250,000	100	.....	5,250,000	Sept. 1903	1.75
Cummings Cement.	N. Y.	300,000	3,000	100	.....	216,000	July 1903	9.00
Dabney Oil.	Cal.	1,000,000	1,000,000	1	37,500	182,500	Feb. 1904	.03¾
Empire S. & I., pf.	U. S.	5,000,000	23,700	100	.....	387,350	July 1903	1.00
Fairmont Coal.	W. Va.	12,000,000	120,000	100	240,000	240,000	Feb. 1904	2.00
Four Oil.	Cal.	300,000	208,700	1	6,261	62,023	Mar. 1904	.01
General Chem., com	U. S.	12,500,000	74,103	100	.....	1,300,575	Dec. 1903	1.25
General Chem., pf.	U. S.	12,500,000	100,000	100	300,000	2,875,178	Apr. 1904	1.50
Giant Oil.	Cal.	800,000	800,000	1	.....	144,000	Jan. 1903	.02
Higgins Oil.	Tex.	2,500,000	17,600	100	.....	96,850	Apr. 1902	1.50
Home Oil.	Cal.	100,000	100,000	1	.....	492,500	June 1903	05
Houston Oil, pf.	Tex.	7,500,000	75,000	100	.....	896,500	Feb. 1903	3 00
Imperial Oil.	Cal.	1,000,000	100,000	100	80,000	580,000	Apr. 1904	20
Int'l Acheson, pf.	N. Y.	500,000	5,000	100	.....	105,000	July 1903	3.50
Jeff. & Cl'f. C. & I. com.	Pa.	1,500,000	15,000	100	.....	180,000	Aug. 1903	5.00
Jeff. & Cl'f. C. & I., pf.	Pa.	1,500,000	15,000	100	37,500	638,000	Feb. 1904	2 50
Lehigh Coal & Nav.	Pa.	14,346,650	286,933	50	.....	21,041,449	Nov. 1903	1 50
Maryland Coal, pf.	Md.	2,000,000	18,850	100	.....	1,046,135	Dec. 1903	5 00
Monong. R. Coal, pf	Pa.	10,000,000	97,300	5	347,165	3,471,510	Jan. 1904	3.50
Monte Cristo Oil.	Cal.	500,000	500,000	1	5,000	40,000	Mar. 1904	.01
National Carbon, pf.	U. S.	4,500,000	45,000	100	78,750	1,653,750	Feb. 1904	1 75
New Central Coal.	Md.	1,000,000	50,000	20	20,000	270,000	Mar. 1904	.40
Ohio & Ind. Gas.	U. S.	10,000,000	800,000	100	.....	1,440,000	Dec. 1903	1 00
Oil City Petroleum.	Cal.	500,000	500,00	1	2,500	2,500	Apr. 1904	.00½
Pacific Coast Borax.	Cal.	2,000,000	19,000	100	58,000	1,592,500	Mar. 1904	1.00
Peerless Oil.	Cal.	1,000,000	92,000	10	51,520	241,920	Apr. 1904	.14
Penna. Salt	Pa.	3,000,000	60,000	50	180,000	13,630,600	Apr. 1904	3 00
Penna. Steel	Pa.	25,000,000	168,214	100	.....	3,505,750	Nov. 1903	3 50
Phila. Gas, com.	Pa.	16,102,131	308,542	50	462,812	3,870,643	May. 1904	.75
Phila. Gas, pf.	Pa.	3,988,350	212,873	50	99,960	1,109,026	Mar. 1904	1.25
Pittsburg Coal, pf.	Pa.	32,000,000	297,012	100	519,771	8,836,107	Jan. 1904	1.75
Pittsburg Oil.	Cal.	300,000	240,000	1	.....	48,000	Dec. 1903	.32½
Pocahontas Coll., pf	W. Va.	1,500,000	15,000	100	22,500	212,500	Mar. 1904	.50
Rep. Iron & Steel, pf	U. S.	25,000,000	204,139	100	.....	6,053,476	Oct. 1903	1.75
San Joaquin Oil.	Cal.	100,000	100,000	1	440.000	625,000	Mar. 1904	2.20
Shelby Iron.	Ala.	1,000,000	10,000	100	.....	840,000	Nov. 1903	5.00
Sloss-Sheffield, pf.	Ala.	20,000,000	67,000	100	234,500	1,970,500	Apr. 1904	1.75
Somerset Coal.	Pa.	4,000,000	40,000	100	80 000	80,000	Feb. 1904	2.00
St. Bernard C. & C.	Ky-Ten.	1,000,000	10,000	100	.....	770,000	Dec. 1903	6.00
Standard Oil.	U. S.	100,000,000	970,000	100	15 520,000	2235,000	Mar. 1904	16.00
SundayCreek Coal, pf	Ohio	150,000	1,500	100	.....	15,750	Aug. 1903	3.00
Susq. I. & S., pf.	Pa.	1,500,000	300,000	5	.....	762,500	June 1903	3 15
Temple Iron.	Pa.	240,000	2,400	100	.....	21,500	July. 1903	2.00
Tenn. C. I., com.	Tenn.	23,000,000	225,531	100	.....	1,102,800	Nov. 1900	2.00
Tenn. C. I., pf.	Tenn.	248,000	2,480	100	9,920	317,024	May 1904	2 00
Thirty-three Oil.	Cal.	500,000	100,000	5	40,000	280,000	Apr. 1904	.10
Thomas Iron.	Pa.	2,500,000	25,000	200	.....	200,000	Aug. 1903	4 00
Tidewater Steel, pf.	Pa.	600,000	60,000	1	.....	30,000	July 1903	.20
Union Oil.	Cal.	10,000,000	52,672	100	36,870	852,812	Jan. 1904	.70
Union Nat'l Gas.	Pa.	8,000,000	22,700	103	45,000	225,000	Jan. 1904	2.00
U. S. Steel Corp., com	U. S.	550,000,000	5,083,025	100	.....	53,360,978	Dec. 1903	1 50
U. S. Steel Corp., pf.	U. S.	360,281,100	3,602,811	100	12,610,984	105,487,897	ay. 1904	1.75
Va.-Carolina Ch., com	U. S.	38,000,000	279,844	100	.....	3,678,829	June. 1903	1 25
Va.-Carolina Ch., pf.	U. S.	2,000,000	120,000	100	480,000	7,500,839	Apr. 1904	2.00
Westmoreland Coal.	Pa.	5,000,000	250,000	50	.....	8,250,000	Sept 1903	50
West Shore Oil.	Cal.	100,000	100,000	1	5,000	110,000	Mar. 1904	05
.....		.....	.....	.....	.....	.....	.....	.....

CANADA, CENTRAL AND SOUTH AMERICA, MEXICO.

Name and Location of Company.		Authorized Capital Stock.	Shares. Issued.	Par val	Dividends. Paid 1904.	Total to Date.	Latest. Date.	Amt.
Amistad y Concordia	Mex.	$480,000	9,600	$50	$27,360	$192,648	Jan. 1904	$2.85
Barreno, g. s.	Mex.	.....	2,400	...	.....	63,946	June 1903	.86
Bart. de Medina Mill	Mex.	50,000	2,000	25	5,280	85,008	Feb. 1904	1.32
Buena Vista, g. s.	Mex.	100,000	1,000	100	.....	5,000	June. 1903	5.00
Butters' Salvador, g.	Salv.	750,000	150,000	5	36,000	288,000	Feb. 1904	.24
Cariboo McKin'y, g. s.	B. C.	1,250,000	1,250,000	1	50,000	546,837	Feb. 1904	.04
Carmen, g. s.	Mex.	27,500	1,100	25	.....	78,616	Nov. 1903	.99
Carmen-Guanaj. g. s.	Mex.	725,000	145,000	5	.....	27,750	Oct. 1903	.12½
Cinco Senores.	Mex.	.....	2,000	...	.....	711 935	July. 1903	4.10
Copiapo c.	Chile	1,125,000	112,500	10	.....	2,865,900	Feb. 1903	.36
Crow's Nest Pass	N. S.	3.500,000	121,486	25	83,262	882,685	Jan. 1904	2.50
Dominion Coal, com.	N. S.	15,600,000	150,000	100	.....	1,050,000	Dec. 1903	1 75
Dominion Coal, pf.	N. S.	3,000,000	30,000	100	.....	2,280,000	July. 1903	2.00
Dominion I. & S. pf.	N. S.	5,000,000	50,000	100	.....	875,000	Sept. 1903	3.50
Dos Estrellas, g. s.	Mex.	150,000	3,000	50	39,750	622,575	Mar. 1904	4.50
El Oro, g. s.	Mex.	5,750,000	1,080,000	5	.....	2,514,400	Dec. 1903	.18
Esperanza, s. g.	Mex.	2,275,000	455,000	5	.....	1,154,199	Aug. 1903	4.40
Fraternal, s.	Mex.	5,000	1,000	5	.....	51,263	Nov. 1903	2.18
Granby Con.	B. C.	13,363,030	1,336,303	10	.....	133,630	Dec. 1903	.10
Greene Con., c.	Mex.	8,640,000	864,000	10	.....	651,820	May. 1903	.20
Guadalupana, g. s. l.	Mex.	15,000	3,000	5	.....	69,930	Mar. 1903	.77
Guadalupe	Mex.	1,000,000	10,000	100	.....	3,515,750	Apr. 1903	.77
Guggenheim Expl.	Mex.	17,000,000	105,000	100	367,500	918,750	Apr. 1904	1.75
Le Roi No. 2. g.	B. C.	3,000,000	120,000	35	28.800	316,800	Feb. 1904	.24
Mesquital, g. s.	Mex.	125,000	250.000	½	.....	51,458	Feb. 1903	.06
Natividad, s. g.	Mex.	36,000	2,400	15	36,000	308,463	Mar. 1904	5.00
N. Y. & Hond. Ros.	C. A.	1,500,000	150,000	10	15,000	1,800,000	Mar. 1904	.10
N. S. St. & Coal, com.	N. S.	5,000,000	41,200	100	123,600	638,600	Apr. 1904	3.00
N. S. St. & Coal, pf.	N. S.	2,000,000	10,300	100	41.200	247,200	Apr. 1904	2.00
Penoles, s. g.	Mex.	125,000	2,500	50	135,000	2,624,114	Mar. 1904	18.00
Providence, g. s.	B. C.	200,000	5,560	5	.....	2,224	Dec. 1903	.10
Providencia (S. J.)	Mex.	90,000	6,000	15	.....	169,740	Feb. 1903	.77
Rambler-Cariboo, s. l.	B. C.	1,250,000	1,250,000	1	.....	230,000	Nov. 1902	.01½
Real del Monte,	Mex.	.....	2,554	...	11,238	2,938,122	Jan. 1904	4.40
Soledad, s. l.	Mex.	19,200	960	20	12,749	277,461	Mar. 1904	4.50
Sorpressa, g. s.	Mex.	19,200	960	20	6,384	206,450	Mar. 1904	2.25
San Rafael.	Mex.	60,000	2,400	25	71,297	2,039,517	Mar. 1904	.....
Sta. Gertrudis, g. s.	Mex.	1,920,000	38,000	50	25,632	2,805,792	Feb. 1904	.....
St. John del Rey, g.	Brazil	3,000,000	546,265	5	.....	14,158,949	Dec. 1903	.12
Sta. Maria de la Paz.	Mex.	.....	2,400	...	5,280	1,967,653	Jan. 1904	2.20
Torreon Metallurg'l	Mex.	1,500,000	30,000	50	.....	269,500	Apr. 1903	8.98
Union Mill	Mex.	150,000	3,000	50	10,800	424,223	Mar. 1904	1.84

NOTE.—These dividends are published gratuitously Readers are invited to send any additions or corrections which they think necessary to complete our list.